THE STOS.

THEORY

OF

SCIENCES

Grounds and Principles

OFTHE

Seven Liberal Arts

Grammar | Musick | Arithmetick | Rhetorick | Geometry | Aftronomy.

Accurately Demonstrated and Reduced to

With Variety of Questions, Problems and Propositions both Delightful and Profitable.

By H. Curson, Gent. K

L .O N D O N,

Printed, for Richard Smith at the Angel and Bible without Temple-Bar. MDCCII.



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PREFACE

TO THE

READER.

Theme very needless, none doubting the excellency and necessity thereof. Solomon's desire was not Riches, but Wisdom and understanding that he might govern so mighty a People. Rome saw her best days under her Learned Kings and Emperors, and the Persians would elect none but Philosophers for Kings A 2 and

and though we read that Licinius, and Lewis the Eleventh King
of France were Enemies to Learning, yet was it Ovid's only Comforter in his Banishment who speaketh thus,

Pectoris exceptis, ingeniją; bonis.
En ego, cum Patria, caream, vobisą;
(domoą;
Raptaque sint, adimi qua potuere
(mibi
Ingenio tamen ipse meo comitorque,
(fruorque,
Casar, in boc potuit furis babere
(nibil,
Qui libet banc sauo vitam mibi siniet
(ense
Me tamen extincto, fama perennis erit.

Which

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Which I find thus Englished by a certain Author.

Hut our brave thoughts and Inge(nuity.

Even I that want my Country,
(House and Friend
From whom is ravishedall that Fate
(can rend;

Posses yet my own Genius and
Enjoy
That which is more than Casarcan
(destroy
Each Groom may kill me: but
(when e're I die
My Fame shall live to Mate Eter(nity.

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The Sciences (as the Spring from whence all other Learning flows) have been ever held in great E-freem by the Ancients, tho now A 3 they

they feem to be something lesser regarded, probably by reason of their Intricacy, and being dressed up in Foreign Languages, which being not easily acquirable to some whole want of Latine and other Languages, renders 'em incapable to learn the admirable secrets of Sciences, they by meer necessity must decline the Knowledge thereof. But having defigned to Publish a Book called The Gentlemans Treasury, containing choice Collections in all Arts and Sciences with several other Treatises and Discourses to which I shall refer you, and believing that several of the Ingenious upon perusal of that manual of Rarities would be desirous of some knowledge in the Rudiments of those Sciences that afford fuch delightful and profitable Experiments, so very useful and beneficial to all men, I was induced

to Compose this Theory of the Sciences, wherein is briefly demonstrated the Solid Grounds and Principles of the Seven Liberal Arts, which are the foundation of all Sciences and Professions. This Book containeth matter distinct from what is in my other Book, and is reduced to this Compass for the more speedy Improvement of those whose other occasions will not permit them time for long Study, and will be affiftant to all, as well in the understanding of most other Books as my Gentleman's Treasury, which had swelled too much had I incerted what is the substance of this Book therein, and rendered it inconvenient, whereas now both may be sometime or other useful for every one to read, as his reafon or Genius inclines him. this Collection may be of more esteem to some, being judicially and

and carefully Epitomized for the encouragement of those who are many times disencourged by the fight of large Volumes, from undertaking the fatigue of many years supposed laborious Study, which makes them prefer an eafy Ignorance before a hard acquired Knowledge, but here the Reader will find the matter fo inviting and succinct he scarce will have power to relift the attaining of Sciences at so cheap a rate, and small expense of time as bestowing two or three hours every day in reading, apprehending and retaining whatever he reads, when the method and brevity will please, the Stu-dy delight, and the Instruction of a good Master in these Sciences make him foon perfect therein. And may be advantageous to all Gentlemen who will not only find the instructive part of Science, but alio

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also be informed without any mechanick Operation in the Menfuration of Land, Timber, Stone, Solids, &c. And of all Bricklayers, Carpenters, Plaisterers, Joyners and Masons work, to prevent their being defrauded by Architects and others who build for them. Also give them an infight in Navigation Gauging, Gunnery, Mortar-pieces Dyaling and Astrology, with many profitable Experiments in the Sciences Beneficial to all and of use for ever, with the Censures and Objections made by Agrippa, Des Gartes and others abusive to the Sciences, and diverting to the Wits.

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Agrippa and Planes Comments of the frology

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Dirata.

र्था में क्ष्म के तिस्त के स्थापने करते हुत हो है है। स्थापन के क्ष्म किस्त के स्थापने करते हैं के स्थापने के किस्

OIL A M.

GRAMMAR.

Rammar is an Art of speaking and writing a Language correctly, and taketh its Name from the
Greek >pauudrum, ns, which

comes from papea, i.e. Litera, quia Grammatica docet principium literatura, & est Scientia literaria. It is the first of the Liberal Arts and Sciences, and the Latine Grammar (as all other Books) is composed of Words, which words are made up of Letters being either Vowels or Consonants. Its chief Division is into four parts, viz. Orthography, Etymology, Syntax, and Prosody.

ORT HOGR APHY.

Orthography teacheth us to write words with proper Letters, and pronounce syllables with due time. Now a Letter is the least part of a word, and the Latine Tongue hath 25 of them, to wit, ABCDEFGHIJKLM NOPQRSTUVXYZ, there being no W. written nor heard in the found thereof; nor are KYZ uled in pure Latin, but only in foreign words; and altho you find H here written, yet hath it not the power of a Letter, being only a fign of Aspiration. These letters are divided into Vowels, viz. a. e. i. o. u. y. so called, because they render a found of themselves; and Confonants, viz. b. c. d. f. g. h. k. I. m. n. p. q. r. s. t. x. z., and great J. and great V.; and are called Confonants because they render a found with another letter; as Amo, a is a Vowel that founds of it self, and m a Confonant, because it founds with another letter. A Diphthong is the found of two Vowels in one Syllable. The number of these Diphthongs is different in Grammarians, for fome account

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account them eight; viz. x. ai, au, ei, eu, œ, oi, ui, or, yi; others make them but four, viz. œ, æ, au, eu. The Mutes are nine, viz. b. c. d. f. g. k. p. q. t. and are fo called because they are still, and have no proper found. The Half-vowels (fo called because they are Confonants which make a found by themselves as tho a Vowel were preponed) are also reckoned nine, viz. I. m. n. r. s. x. z. jod. ve. of which I. m. n. r. s. are called Liquids, betause the sound seems melting and soft; k. z. j. are called Double-Confonants, because they seem to have the force of two Confonants. He who has a defire to read more about the Latine Letters and the Letters of other Languages, may look in the Treatise of Letters in my Book called the Gentleman's Treasury.

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A Syllable is the discovery of a perfect found at one motion of the Breath, and may consist of one or more Letters, as may be seen in many words. Why Josephus is spell'd with an J. and not with a G. is because G. (like the Greek Gamma) founds hard before a. o. u. And ph. is used because it sounds like f. as ch. like k. A Consonant set between two B 2 Vowels

Vowels belongs to the following Vowel, and begins that Syllable, but x belongs to the former in any word; and Confonants which cannot be joyned in the beginning of a Word, must be parted in the middle, as Prin-ceps. Why Audacia is writ with cia, not fia nor tia, is because derivative words are spell'd with the same Letters their Primitives are; and this may ferve to fatisfy the Reader of many other words, which I omit, as designing all possible Brevity, as well as information in this fo compendious a Work. Quantity, or Time of pronouncing Syllables, is threefold; long marked over the Vowel (); short marked thus ('); or Common (which is long or short as we please) marked thus ().

A Word of one Syllable is called a Monofyllable, and from words which are a comprehension of Letters and Syllables proceed Sentences, Speeches

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and Languages.

Points used in the separation of a Speech is twofold, of an Impersect, and a persect Sentence. Points of an Impersect Sentence are 1 a Comma (,) made at the end of a few Syllables. 2 Semicolon (;) used about half the space between

between a Comma and a Colon, being a distinction which giveth us a time to Breath. The Points of a perfect Sentence are 1 a Colon (:) called also a Member, which divides the Sentence into two parts, or is a stop which grants more time to Breath: And 2 a Period (.) or Pand, which is a full stop.

Parenthesis () shuts up a Sentence between two Semicircles, which if omitted in the reading, the Sence would

et remain whole.

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Interrogation (?) is used at the end of Question; as, Who are you?

Note of Exclamation or Admiration is

marked thus (!)

Hyphen(-)Couples together two words, and is always used when a word is parted at the end of a Line.

Section (9) Divides a large discourse

nto two parts.

Parathesis [] are used in Expositions.

Asterism * in Annotations.

Obelus + in Versions.

Equal Lines in Quotations are mark-d thus ||.

Note of Citation (") when Authors are

ited word for word.

Index points out something of Note.

B 3 Ina

Induction A is for the bringing in

something omitted.

Apostrophe? is used when a Letter is purposely lest out, as 'twas instead of it was.

Dialysis or Diaresis (") is used to part a Diphthong, and is made over the Vowels; as, Aer, Poeta, that they may not be pronounced Ær, Pæta.

Paragraph ¶ is an absolute Passage

or Article.

Grave Accent is used over a Vowel, when the Voice must be Depressed.

Acute Accent ' when the Voice is to

be raised higher.

Crasis is used over Circumstex Syllables long by Nature, as Di pro Dij.

Small Alphabetical Letters as ab or d, &c. refer to feveral Marginal Notes

or Explanations.

The Figures belonging to Orthography are Twelve, whose use is chiefly to allow some Liberty to Poets for making their Verses run more smooth, which they call Carminis gratia. They are,

syllable to the beginning of a Word.

2. Aphæresis which takes away a Letter or Syllable.

3.Syn-

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3. Syncope taketh away a Letter or Syllable from the middle of a Word; which,

4. Epenthesis addeth thereunto.

5. Apocope takes away a Letter or Syllable from the end of a Word; which

6. Paragoge addeth thereunto.

7. Antithesis and

8. Antistachon change one Letter; for another.

9. Metathesis misplaceth a Letter as for

Thymber is writ Thymbre.

parts of a Compound Word, by Interpoling something between them.

11. Symaresis contracteth two Syllables

into one.

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12. Diaresis divideth a Syllable, and of one maketh two.

See more of Orthography at large in the Grammarians Books, and among others in Jasz Berenys's Fax Nova, Hool's Easy Entrance to the Latine Tongue, Lily's Grammar, Ob. W. his Instructions in the Art of Grammar, Lane's speedy Method of attaining the Latine Tongue, Clare's Compleat System of Grammar, Berault's

B 4 New,

New, Short and Exact Latine Gram-

ETTMOLOGT.

Etymology teacheth the Definitions, Divisions and Accidents of the parts of Speech or Languages; but before I speak of the parts of Speech I shall

fay fomething of

The Figures belonging to Etymology, 1. Antimery is when one part of Speech is used instead of another, as Scire tuum for Scientia tua. 2. Enallage changeth one Person, Number, Tense with Mood and Gender for another, as Pereo quod charius est mi. 3. Hellenism is when Latin words are declined like to Greek words, as familias for familia; or have a Greek construction, as Desine clamorum, fallunt, ardebat Alexin; abstinet ir arum, ir arum is used for irâ. 4. Archaism tolerateth old, obsolete and also new coyned words, as mis, tis, anuis, i.e. mei, tui, anus.

The parts of Speech are Eight, viz. Noun, Pronoun, Verb, Participle, Adverb, Conjunction, Preposition and Interjection. The four first whereof are only declined.

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I. A Noun is that part of Speech which fignifies a Person or a Thing ; as Terra the Earth, and is two-fold, Substantive and Adjective. A Substantive is a word that fignifies a thing that may be declined in good Sence in every ones Native Language; as the word Man,&c. which I know to be a Substantive, because I can decline it in good Sence, Man, of Man, to Man, &c. In English they may have a, an or the applyed to them, as Homo a Man, Dominus the Lord. Aor an is used when we don't determine which we mean. Substantives are of two forts; Proper given to some one individual thing of a kind, Peter, London: Or Common, which fignifies some one kind of thing but is common to all of that kind, as City, Kingdom. Some Substantives are Collectives fignifying many things together as Plebs the People. A Noun Adjective or Adjunct (in Rhetorick called Epithets, in Logick Concretes) requires to be joyned to some Substantive to make its fignification more intelligible; as Albus equus a White Horse (Albus is Adjective, Equus Substantive) and in English they may have thing or person joyned to

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to them. And Note that Adjectives are sometimes placed without Substantives expressed, and then if they be of the Masculine or Feminine Gender, [a person] He or She, Man or Woman is understood; as Doctus est, He, or the Man is Learned. But if of the Neuter Gender thing is understood; as hoc album this white thing.

Eight things belong to a Noun, r. Person. Liber a Book is of the third Person, because every Noun, Participle, and whatsoever is put instead of a Substantive, are of the third Person; as Scire tuum, pro Scientia tua, thy Knowledge.

2. Number, which of Nouns, Pronouns, Verbs and Participles are two, viz. The Singular which speaketh but of one, and the Plural which speaks of more, and in English is made by adding s to the Nominative Singular, as King, Kings, &c. but there are many Irregulars, as when the old Saxon termination en is reserved; as, Ox, Oxen; Man, Men for Manen. What Masculines are content with the Plural Number only, altho' they may seem to signify but one thing, may be seen in Clare's compleat System of Grammar. 3. Case, which is the proper termination

of

of a Noun, Pronoun or Participle, by which it swerves from the Nominative. The Declining of a Noun is the variation thereof according to the various State or Case of the thing signified by it, and in Grammar every thing is confidered in a fix-fold State or Cafe: viz. The Nominative which cometh before the Verb in English; as Sol lucet the Sun shineth. Ob. W. in his Instructions in the Art of Grammar, faith that the Nominative is not properly a Case (and Aptotes are not so called because they have no Case, but none proceeding from the Nominative) for the Noun or Name it felf is faid to be the Nominative Case, and is the Foundation or Subject of Speech. fecond Case is the Genitive, which shews that either one thing proceeds from another or belongs to it; as Filius Regis, the Kings Son; Cafaris Gladius, the Sword of Cafar. The third Cafe is the Dative known by the fign to; as, Do tibi Consilium, I give thee Counsel. fourth Case is the Accusative, which tollows the Verb and is governed by it; as, Amo Deum, I Love God. The fifth is the Vocative Case known by calling, O Petre, O Peter, and is most-

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ly the same with the Nominative, and the fixth is the Ablative Case which takes away from, and is commonly joyned with a Preposition serving to the Ablative Case; as, Accipio à te, I receive from thee. If any of these Prepositions in, with, thro, for, from, by or than, &c. come before a Noun, that Noun in Latin is put in the Ablative Case. Note, our English Language is in expressing these Relations more Accurate and Distinct than the Latine, but the Latine more Elegant than the English as avoiding the so frequent repetition of the same Monosyllable: And Note also that in Construing Latine into English you add always the fign of the Cafe, because it serves instead of the Termi-Of Nouns which are varied nation. into no Case, but are applyed to every Cafe and called Aptotes, See Clare's Compleat System of Grammar.

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4. Declension is the Declining of a Noun according to the Case; and they are five in Number, and known by their Genitive Cases Singular. The first Declension hath four Terminations a, as, es, e; as Musa, Eneas, Anchises, Penelope, but the Termination in a is only Latine, and is known by its Genitive Case Sin-

Singular in a Diphthong, and thus Declined;

Sing. No. hæc Mensa, G. hujus Mensa, D. huic Mensa, A. hanc Mensam, V. o Mensa, Ab. ab hac Mensa.

Plur. N. hæ Mensæ, G. harum Mensarum, D. his Mensis, A. has Mensas, V. o Mensæ, A. ab his Mensis.

Filia, Mula, Equa, Nata, Dea, Liberta, make abus in the Dative and Ablative Plural. Filia and Nata make is also.

The Second Declension hath five Terminations, us, um, ir, er, ur, as Dominus, Regnum, Vir, Magifter, Satur, and hath its Genitive case in i; as Dominus, Domini. Some Nouns in er do increase in their Genitive, as Lucifer, Luciferi, and some do not increase as niger, nigri. The Nouns in us make their Vocative in e, as Dominus, Domine, maketh Deus Nouns in

in e, as Dominus, Domine, but Deus maketh Deus. Nouns in ius make their Vocative in i, as Antonius, Antoni, but Meus maketh Mi, Pius maketh Pie.

Sing. Dominus, ni, no, num, ne, no.
Plur. ni, norum, nis, nos, ni, nis.
Sing. Magister, stri, stro, stro, strin, stri, strorum, stris, stros, stri, stris, stros, stri, stris.

Sing. Regnum, ni no, num, num, no, Plural. na, no-rum, nis, na, na, nis.

Pie. All Neuter Nouns have three Cafes alike, viz. Nom. Accus. and Voc. which all end in a in the Plural Number, as may be seen in Regnum.

Sing. Pater, tris, tri, trem, ter, tre. Plur. tres, trum, tribus, tres, tres, tribus.

bus.
Sing. Bonitas, tatis, tati, tatem, tas, tate. Plur. ta-

tes, tatum, tatibus, tates, tates, tatibus. Sing. Anigma, matis, mati, ma, ma, mate. Pluraliter, mata, matum, matibus, mata, mata, matibus.

thus:

Sing. Manus, nus, nui, num, nus, nu. Plur. nus, nuum, nibus, nus, nus, nibus. Sing. Genu, u, u,u, u. Plur. nua, nuum, nibus, nua, nua, nibus. The fourth Declention endeth in us and in u. Nouns in us have their Genitive Case Singular in us: Nouns in u are undeclined in the Singular Number; but Lacus, Arcus, Spe-

third Declension

hath feveral Terminations,

and its Genitive Cafe Sin-

gular in w, and is Declined

cus, Artus, Tribus, Portus, Partus, Veru, and Genu make ubus in the Data and Abl. Plural, but Portus and Genu make also ibus: Jesus maketh Jesum in the Accus. and Jesu in the other Cases.

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The fifth Declention endeth in es, and hath its Genitive Case in ei. Of Nouns compounded see Berault's Grammar.

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Sing. Faci-s, ciei, ciei, ciem, cies, cie. Plur. cies, cierum, ciebus, cies, cles, ciebus.

Adjectives having three endings in the Nominative Case, are declined by the first and second Declension of Substantives. But all other Adjectives are declined by the third Declension of Substantives.

The 5th. thing belonging to a Noun is Gender which the Latine (for some Languages have no Genders) makes to be three, the Masculine, the Feminine and Neuter; to which three are commonly applyed the like Genders of the Pronoun Hic, hac, hos. these Genders is added The Common of Two, because it belongs to both Sexes, as his & has Parens the Father and Mother: The Common of three, because declined with three Articles, as hic, hac & hoc Fælix Happy. The Doubtful, because declined now with one Gender, and then with another, as his vel has Dies the Day. And the Epicene declined with one Article, under which both kinds are signified, as Hic Passer a Sparrow, hec Aquila an Eagle. See Lane's speedy Method of attaining to the Latin Tongue. For a larger explanation of Genders, See Clare's compleat System of Grammar, and for a Table of the Genders of Latin Substantives and Ex-

ceptions, see Lane aforesaid.

The 6th is Comparison, of which there are three Degrees. The Positive, which signifieth the thing without Excess and Comparison, as Sanctus Holy: The Comparative, which compareth one thing with another, and exceeds its positive in signification, as Sanctior more Holy; and the Superlative, which signifieth the thing in the highest Degree, and is formed from the same, by adding simus as Sanctissimus most Holy. The Adjectives in er make their Superlatives in timus.

The 7th thing is Species, which is twofold; Primitive which is not taken from any other word, as Pater a Father; and Derivative derived or formed from ano-

ther word, as Paterne Fatherly.

The 8th and last is Figure, which is also twofold, that is to say Simple, as just; and Compound, as unjust. And here observe that a word which is Compounded of two Nominative Cases

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is declined in them both, as for Example. Nom. Voc. Rei-publica, Gen. Rei-publica, &c. See more Examples in the Grammars.

And now we come to the fecond part

of Speech, which is

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II. A Pronoun is that part of Speech which we use in relating or rehearling any matter, as instead of naming Perfons we say Ego I, Tu thou, Ille he, and they are called Pronouns, because used for or instead of Nouns, and they Regulate Verbs and Adjectives, and therefore have the same use as Nouns, There are Nineteen Pronouns to be tound in Clare's System of Grammar; Berault maketh them but fifteen, Eight Primitive, Ego, tu, sai, ille, ipse, iste, hic, is, and seven Derivative, viz. mens, tuns, suus, noster, vester, nostras, vestras. The Accidents of a Pronoun are seven, viz: Person, Number, Case, Declenfion; Gender, Species and Figure. In Logick a Person is nothing else but one fingle or intellectual Man or Angel; but in Grammar it is otherwise, for Persons are either in speaking the Speaker called the First Person, Or the spoken to called the Second Person, Or the fpoken

spoken of, called the Third Person: And of this Person are all things except by some Figure we either speak to them or seign them speaking, and then it is understood Tu or Ego. The Numbers and Cases are the same as in Nouns. The Declensions are four. Ego, tu, sui are of the first Declension. Ille, ipse, is, idem, qui are of the second. Meus, tuis, suus, noster, vester, cujas of the Third, and nostras, vestras of the Fourth. Genders are three as Nouns Adjectives are. And the Figure of a Pronoun is Simple, as Ego I. and Compound, as egomet I my self.

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III. A Verb is a word that fignifies the Action, Passion or Being of a thing and is declinable by Moods and Tenses, as Amo Ilove, Amabam I did love, Amavi I have loved, &c. And a Verb is twofold Personal and Impersonal. Personals are declined with three Persons as Ego Doceo I teach; tu doces thou teachest; ille docet he teacheth. Impersonals are declined without Persons, as opor et it behoveth, and wants the first and second Person in both Numbers, but a Verb impersonal of the Passive Voice may indifferently be taken for every Person of either Number as ubi

incipitur à me where do I begin; à te. ab illo, à nobis, à vobis, ab illis, and a Verb impersonal wants the Supines and Gerunds, but hath Eight Accidents; viz. Kind, Mood, Tenfe, Conjugation, Num-

ber, Person, Species and Figure.

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There are four kinds of Verbs. r. A Verb Active which endeth in o and denotes an Action, as Amo I Love; and becomes 2. A Passive by putting an r to 3. The Verb it, as Amor I am loved. Neuter ends in o or m, as Bibo I drink; Sum I am, but can neither become wholly Active nor Passive both in Signification and Termination. 4. A Verb Deponent ends in or but hath usually an Active fignification, as loquor I speak, but r is never taken away as in Passives. A Deponent hath also Gerunds and Supines like an Active which a Passive hath not. Some to these add a Verb Common which ends in or but hath both Active and Passive fignification, as Ofculor I kiss thee, Ofculor à te I am kiffed of thee.

A Verb hath four Moods, 1 Indicative in which Mood Verbs of mentioning, affirming, denying and demanding are put, and this Mood shewoth either the thing or the Person.2 Con-

junctive?

junctive, in which Mood are put Verbs of wishing and desiring wherein also is signified a thing able or willing, or which ought to be done. 3. Imperative, in which Mood are put Verbs of commanding, advising, praying, forbidding and permitting. It hath a double present Tense, the first signifies more immediately than the latter, as, Lege, legito do thou read, all other Tensesare wanting, and so is the first Person Singular. 4. Infinitive, in which Mood are put the latter of two Verbs having no Conjunction between.

All Verbs are of one Conjugation in the Tenses of the perfect Root, some Verbs are irregular in the Tenses of the present Root, but in the Tenses of the perfect Root there is not one Irregular Verb. There are sive Tenses or Times, The present, The impersect past, Persect past, More than persect past, and the Time to come. In the English Tongue the Tenses are known by their Signs, but in Latine by the Terminations in the Moods. The English Signs of Tenses are,

Present Tense. Impersect Tense.
Active do, doit, doth. Act. did, didst.
Passive am, art, is, are. Pas. was, wast, were.

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Perfect Tense. Pluperfect Tense.

Act.have,hast, hath. Act. had, hadst.

Pas. have been, &c. Pas. had been, &c.

Future Tense.

Active shalt, wilt.

Paffive shalt be, wilt be.

The Present Tense speaketh of the time

present, as Amo I Love.

The Preterimperfect Tense sheweth the time not perfectly past, as Anabam I did Love.

The Preterperfect Tense sheweth the time is perfectly past, as Amavi I have

Loved.

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The Preterpluperfect Tense sheweth the time is so perfectly past it can't be interrupted, as Amaveram I had Loved.

The Future Tense sheweth the time to come, as 'Amabo I shall or will Love.

The Gerunds end in di, do, dum, and have both Active and Passive signification, as Amandi of Loving or of being Loved.

The Supines are two in um and u; the first hath an Active signification, as Eo Lusum I go to Play, the latter mostly a Passive as hoc est difficile dictu that is C ? hard

hard to be faid. The Participles may be feen hereafter.

Verbs have two Numbers, Singular and Plural. The Sing. speaks but of one, as Amo I Love, Amas thou Lovest, Amat he Loveth. The Plur. of more, as amamus we Love, Docetis ye teach, Legurt they read. It hath three Perfons in the Singular, viz. Ego, tu, ille, and three in the Plural, nos, vos, illi, but these Persons are seldom expressed in Latine.

Sum is called a Verb Substantive because it declares onely the being of a thing without mentioning any Action or Passion, as Sum Domi I am at home.

The Conjugations of Verbs are four, the first ends in o, and hath a Consonant standing before it, and hath à every where before re and ris, as amo, amare. The second hath an e long, as moneo, monere, The third an e short, as lego legere. The fourth an i long, as audio audire.

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Indicative Mood.

Present.
Imperf.
Perf.
Perf.
Pluperf.
Pluperf.
Future.

Amo, mas, mat.
Amabam, bas, bat.
Amavi, visti, vit.
Amaveram, ras, rat.
Amabo, bis, bit

Amount, matis, mant.
biamus, batis, bant.
wimus, vistis, verunt vel vere ramus, ratis, rant.
bimus, bitis, bunt.

Examples of the other Moods and Conjugations, the Species and Figures of Verbs, also Irregular and Defective Verbs, may be seen at large in the Grammars before named, and others.

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IV. A Participle is a Noun Adje-Etive derived of a Verb, which marks always fome Tense in its fignification, and is a word declined with Case like a Noun, and fignifies to do or fuffer like a Verb. Participles are not a necessary part of Speech, for Adjectives may supply all their use, but are chiefly invented for short and elegant speaking, and they are of four forts or Tenses. Two come from Verbs Active i. e. fuch as end in ans, from Verbs of the first Conjugation, and ens from those of the three other, and in urus. Two also come from the Verbs Passive, those in tus, sus, and others in ndus,

ndus, the English ending is d. t.n; as praised, knit, seen. A Participle hath seven things belonging to it, viz. Person, Number, Case, Declension, Gender. Time and Figure. And Participles of the present Tense be declined like Adjectives of three Articles, the rest like Adjectives of three endings.

V. An Adverb is a part of Speech undeclined, which being joyned to a Verb perfects and explains its Sence by Whither? How? When? How long? How often? How much? Wherefore? Where? From whence? Whether? and are joyned to other words the better to declare their fignification, for an Adverb fignifies the manner, time, place or fome other circumstance of Doing, Asking, Calling, Affirming, Denying, &c. The Adverbs non and ne go always before the Verb in Latine, but the English Particle not goes always after the Verb or its Auxiliary, as non Amo I Love not.

There be fundry forts of Adverbs according to their fundry fignifications, for fome fignify

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Time	Hodie to day, Cras to Morrow, Nune now.
Place	Ubi where, ibi there, hic here.
Number	Semel once, bis twice, ter thrice.
Order	Inde thereupon, deinde af- terwards, deniq; lastly.
Asking	Cur why? Quor sum to whatend.
Calling.	Heus ho, ehodem come hither a little.
Affirming	Certe truly, na indeed, maxime yes.
Denying	Non not, haud scarce,mi-
Exhorting	Age go to, sodes if you dare.
Wishing	Utinam would to God, ô si O that.
Parting	Seorsim severally, bifáriam two ways.
Gathering together	Simul together, und in one, non folum not only.
Chuing	Potius rather, satius bet- ter.
SA thing no	t Pene almost, vix scarce-
finished	S ly, fere in a manner.
Shewing	En behold, Ecce lo.

Doubt-

Forsan perhaps, fortaffis peradventure.
Forte by chance, fortui- to as it fell out.
Sic so, sicut as, quasi as if.
Bene well, male ill, docte learnedly, for-
Multum much, parvum little.
Tam as well, quam as, aque alike.

VI. A Conjunction is a part of Speech or little Particle that joyneth Words and Sentences together, and for the most part is placed about the beginning of Sentences, as Adverbs about the mid-Conjunctions are principally used to tye the Clauses of a Sentence together, and therefore they make those which by the Logicians are called Hypothetical Propositions, and a great force of Speech depends upon them. According to their fundry fignifications they Copulatives' which couple both Sence and words as Et and, nec neither, Disjunctives sever the Sence not the words, as aut or, vel or.

Dif-

Discretives,
Causals,
Conditionals,
Exceptives.

a difference as sed but, at but.

a Reason nam for, quia because.

a Condition as si if, dum so that.

an Exception as ni unless.

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There are also Interrogatives, Iliatives, Adversativas, Redditives, Electives Diminutives and Inclinatives which may be found in the Grammars.

VII. A Preposition signifies some Relation of one thing or Person to another, either as Distance, Situation, Casualty or the like, and is put before other parts of Speech either in Composition, as ad-monuit he has admonished, or else in apposition, as sedit ad Dextram he sitteth at the right hand. Sometimes Prepositions are used both ways, as adeo ad Patrem I am going to my Father. Prepositions being set without a Case becomes Adverbs, as Coram laudare or clam vituperare inhonestum est. To a Preposition belongs Case, Government or Construction.

VIII. An Interjection declares the Affection of the Mind under a Confused Voice suddenly broke off as O! Out! Alas! and Interjections are questioned by

by some whether they are to be accounted parts of Speech, because they signify sudden motions or expressions of the Passions of the Soul, and are rather sounds only than words.

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STNT AX.

Syntax is an agreeable disposition of the eight parts of Speech amongst themselves and speaks of words as they are united into Sentences. Syntax is twofold Concord which is the agreement of words amongst themselves, and Government which is the dependance of one word

upon another.

To every Sentence are necessarily required 1. a Suppositum (most properly so called, which cometh before a Verb Active) Subject or Noun of the Nom. Case, of which the Speech is made, or something instead of it, to come before the Verb. 2. A Verb to agree with the Nom. Case, or Subject shewing the Relation of being, doing, or suffering, betwixt the Subject and the Predicate which is that spoken of the Subject. 3. Somewhat to follow the Verb which they call a Predicate, and is spoken of the other, and is many times

times included in the Verb; as, Rex

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Venit, i. c. Rex est Veniens. Note, that there are divers forts of Sentences, 1. That which hath no more than one Verb and the Dependants upon it, which some Authors call Periodus Supina; as, Prosperum scelus, vulgo virtus vocatur. 2. Which confifts of more than one Member, and of more than one Verb, but so that each Member stands by it felf; as, Christus è Cœlo, glorificate : Christus in Terram, obvian prodite. Which Period consists of four Members, the two latter corresponding elegantly to the two former. separated by an Half-period or Colon. 3. Which confifts of divers Sentences, but some interposed between the parts of another, which interpolition is either by a Conjunction; as Fortuna, cum blanditur, captatum venit. Qua nocitura tibi, quamvis sint chara, relinque. Or by a Relative; as, Deforme est, quos dignitate præstas, ab ijs virtute superari. Quem sepe transit, casus aliquando invenit. Or by a Participle, Or by a Parenthesis. And therefore in construing it is best for a young Scholar to dispose the words after the Natural Order, separating the Sentences one from another; beginning with with the Voc. Case, then the Nomiand what depends upon it, then the Verb with the Adverb joyned to it, next the Accusative with its dependants, then the Ablative or Dative as they follow. It is necessary also to supply all Ellipsis's, Antecedents, Defetive Cases, One Verb applyed to divers Nom. Cases, or the same Nomi Case to divers Verbs, Subauditurs, &c.

Ellipsis or omission of a word is very frequent in the Latin, as it is in all Languages that affect brevity. Such words are of Noun Substantives which signify a thing common or well known, Areola longa denûm pedum [mensûra.] Verbs also, especially Substantives and Prepositions; Vacuus [â] curis. Note also that the Latines seem to speak many times rather according to the matter and signification, than the words and ordinary Construction; as, Omnium rerum mors est extremum. Duo Millia viri.

The Concords are three, the 1. between the Nom. Case and the Verb, the 2. between the Substantive and the Adjective, the 3. between the Antecedent and the Relative Qui. To which

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wl ry. are added the Rules of the Cases of the Relative, and the Question and Answer.

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The Rule of the first Concord. A Verb Personal agreeth with its Nom. Case in Number and Person; as, Praceptor legit the Master readeth, vos negligitis you neglect.

The Rule of the second Concord. The Adjective agreeth with its Substantive in Case, Gender and Number; as, Amicus Certus a sure Friend.

The Rule of the third Concord. The Relative Qui agreeth with its Antecedent in Gender, Number and Person; as, Vir Sapit qui scit tacere.

The Rule of the Case of the Relative. When there cometh no Nom. Case between the Relative and the Verb, the Relative shall be the Nom. Case to the Verb; as, Miser est qui nummos admiratur. But if there cometh a Nom. Case between the Relative and the Verb, the Relative shall be governed of the Verb or some other word in the same Sentence; as Felix quem faciunt aliena pericula cautum. Happy is he whom others harms do make wary.

The Rule of the Question and Answer: When a Question is asked, the Answer must be made by the same Case and Tense that the Question is asked by; as, Cajus est fundus? Vicini. Whose Ground is this? A Neighbours.

The Rules of the Verbs and all the fix Cases, &c. may be found in all the

Grammars.

There be fix Figures (according to fome Grammarians) belonging to Syntax; but Clare in his System of Grammar makes but four, viz.

is a word in a Sentence more than needs; as, Auribus his audivi, I have heard it

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with these Ears, &c.

2. Syllepsis or Synthesis is when there is an agreement in Sence, but not in words; or is the comprehension of the unworthyer under the more worthy; as, Tuq; puerq; eritis. Both you and the Boy were.

3. Hyperbaton is when the Latines imitate a Greek construction, or changeth the order of words; as mecum for

cum me with me.

4. Ellepsis is when a word is lest out in any Sentence, that ought to be there to compleat the Sence. The thing

thing moveable is made Substantial. Whereas if it be fixed you may understand it, as; They say it is not in paying. What things more; Quid plura. What those Men; Quid istis.

PROSODT.

Prosody is the last part of Grammar, which teacheth how to make Verses well, and two things in Profody are especially to be observed, Namely the Quantity of Syllables, and the Way to

make Verse.

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Verse is a Speech bound to a just and lawful Number of Feet, and there are feven kinds of Verse, viz. Hexameter or Heroic which consisteth of fix Feet in Number, but of two Feet only in kind a Dattyl and a Spondee, the fifth place claims properly a Dactyl to it self. the fixth place claims a Spondee, the rest this Foot or that even as we please. 2. Pentameter or Elegiack. 3. Phaleucick or of eleven Syllables. 4. An Af-5. A Sapphick Verse. clepiad Verse. 6. An Adonick Verse. 7. A Jambick Verse. The last Syllable of every Verse is accounted Common.

A Foot is the fetting or placing toges ther of two Syllables or more accordmg

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ing to the certain observation of the Quantities, and is fourfold, 1. A Spondee which consistent of two long Syllables; as virtus. 2. A Trochee which consistent of a long Syllable first and a short one after it; as Colle. 3. Iambick Foot which consists of a short Syllable first and a long one after it; as, imans. 4. A Daetyl which consistent of three long Syllables; the first is long, the other two are short; as, mittere to send.

Scanning is the lawful measuring of a Verse, into every one or each of the Feet, and there are fix Figures belonging to Scansion, viz. 1. Eclipsis takes away the Letter m with its precedent Vowel at the end of a word. 2. Synalæpha cuts off one Vowel before another. 3. Synaresis is the contraction of two Syllables into one; as, Eripides for Aeripides. 4. Diaresis parteth a Syllable and of it maketh two Syllables; as, Evoluisset for Evolvisset, Evobe for 5. Systole makes a long Syllable short. 6. Dyastole maketh a short Syllable long; and these Figures are often used, Carminis gratia, a Liberty Poets take.

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See the Treatise of Poetry in my Book called the Gentlemans Treasury.

Directions for making Latine, Confirming Latine and for Parsing Latine, &c. may be seen in Hool's and other Grammars.

And here I will present you with a Verse in Carm. Prov. which names the Liberal Arts or Sciences in their due Order.

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Gram. loquitar; Dia. vera docet; Rhet. verba colorat; Mus. canit; Ar. numerat; Geo. ponderat; Ast. colit astra.

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A Synopsis or a short View of the Grounds of Grammar.

The Grounds of Grammar treat of Latine Words.

	[Substan-		2 Numb. Sing. and Plural. Nom. Gen. Dat.
The parts of Spece.	or Adject-		Acc. Voc. Ablat. (Male. Fem. Neuri
	which <	!	7 Genders Common 3 2 3 Doubt. Epicene.
	Proper or Common		5 Declensions whose 3 is Gen. Sing. end in 4 ûs
	2. A Pronoun.		Positive. 3 Degrees Comparative of Comp. Superlative. C Numbers of which in
		belong	Cafee i a Nous
	Perfonal	To which belong	Active, Passive, Neuter, Deponent and Common. Indicative
	is.		4 Moods Imperative Potential Infinitive. Present
			Imperfect Preterperfect. Preterplupertect
	Imperfo-		Future.
	4. A Participle. 5. An Adverb.		Prefent in, ans, ens. Preterperf. in, tus, fus, zus. Future in, rus, dus.
1	6. A Conjunction. 7. A Preposition. 8. An Interjection.		Signification.

COf the First Of the Second Of the Third
To which is Of the Case of the Relative.
added that Of the Question and Answer.
Substantives. Of Concord, A Dative, An Accufative. Of Nouns. An Ablative where is also the Ablative abfolute. The Rules for joyning Words are A Nominative. A Genitive. Of Verbs A Dative. An Accusative. with An Ablative. divers Cases. Of Gerunds and Supines. Of Time, Space and Place. Of Impersonals and Participles. of Confiruction Of Words undeclined. Rules to know the Genders of Nouns.
Rules to know the Preterperfect Tense and Supines of Certain Figures in Latine words. Making Construing Latine. Directions Parling for Writing Some Grammars have. CAccidents. the Common A fhort Grammar. View of Propria quæ maribus. Quæ genus. As in presenti.

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Henry Cornelius Agrippa in his Vanity of Arts and Sciences, faith Grammar as well as Logick, and Rhetorick are oft times the causes of more Mischief than delight, which notwithstanding (saith he) have no other Rule of Truth for their Establishment than the Decrees or Statutes of their first Inventors. which evidently appears in the Invention of Letters themselves, which are the Elements and Materials of all Arts, but fuch are the alterations happening thro' the Viciflitude of times that there are no Language or Letters that are able to make good the Antiquity or Truth of their first Original. And the Latine Grammar (faith he) is fo barren and fo much beholden to Greek Literature, that whoever understands not so much is to be ejected out of the Number of Grammarians. Therefore all the Foundation and Reason of Grammar consists only in the Use and Authority of our Ancestors, who have been pleased that a thing shall be so called, and so written, that words shall be so Compounded and Conftrued, which being fo done they esteem well done. And not one of them have given any Account how the Parts of Speech are to be divided or diffinguish-ed

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ed or what order to be observed in Construction, &c. How it is Lawful to Pronounce in um Latine words terminating in a and us; as for Margarita, Margaritum; for Punctus, Punctum; and how Jupiter makes Jovis in the Genitive Case. Whether a Participle put by it felf, be fometimes a Participle, or whether Gerunds are Nouns or Verbs. Why among the Greeks Nouns Plural of the Neuter Gender are joyned with a Verb of the Singular Number. Why many write most Latine words with a Greek Diphthong, others not, as Felix, Queftio: Whether the Latine Diphthongs are only written and not pronounced; or whether there be a double Pronunciation in one Syllable: Likewise why in some Latine words, fome use the Greeky, some the Latine i. as in considero. Why in some words fome double the Letters, some not; as, causa, caussa; religio, relligio. Why Caccabus by Position long, by reason of the double cc. is notwithstanding by the Poets made a Dactyl. Whether Aristotle's word for the Soul ought to be writ endelechia with a Delta, or entelechia with a Tau, and many other never to be reconciled Contentions about D 4

Accents, Orthography, Pronunciation of Letters, Figures, Etymologies, &c. Such a kind of Battle as this Lucian of Samos hath very elegantly described. about the Confonants of and of whether should have the Victory in the word Thalassa or Thalatta: Answerable to which one Andreas Salernitanes hath with great Wit compiled his Grammatical War. Neither is there any that ever wrote in Latine, whom Laurentius Valla the Learnedst of all the Grammarians hath spared in his Anger, and yet him hath Mancinellus most cruelly Butchered. Didymus is faid to have had 4 fome fay 6000 Books upon the Subject of Grammar, and Prilcian could not learn this Art in the whole time of his Life.

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LOGICK.

Ogick in Latin, Logica vel Dialecti-I ca in Greek Aopund, & xóp , is an Art of Reasoning or Disputation, or according to Blome in his Philosophy, is the art of right Thinking, or of using our Reason aright. Now that a Man may use right reason, and be able to frame his thoughts aright, and interpret them to others; it is necessary for him to perceive aright, Judge aright, Reason aright, and Order aright. are faid to perceive a thing when we clearly and diffinctly conceive the object offered to us. As when we prefent to our Thoughts, God, an Angel, a Circle, &c. and stop there without forming any Judgment concerning them. And the Form by the immediate perception whereof we are Con**scious**

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scious of our knowing any Object is called an Idea. We are faid to Judge when we affirm or deny any thing of the faid known Objects; or when we by the Action of our Mind joyning two Ideas affert the one to be the other; or deny the one of the other. As when confidering the Idea of the Sun, and that of Fire, we affirm the Sun to to be Fire, or deny the Sun to be To Reason or Discourse is that Action of our Mind, which frames a Judgment of many others, or which from two Propositions, or from one infers another; fo observing that the Idea of a Man agrees with that of an Animal, but doth not agree with the Idea of a Plant, concludes that therefore neither can the Idea of a Man fuit with that of a Plant; wherefore finding that Man is an Animal, and that an Animal, is not a Plant it infers this third Propofition that therefore Man is not a Plant. This way of Thinking is called Discourse because by running from one Proposition to another it comes to a Third. To Order is an Action of the Mind whereby many things found in the fame Subject, are disposed in a fit and congruous manner, As when the Mind after

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it has framed feveral Ideas, Judgments and Argumentations, digests them in the most convenient and fit manner for the ready and diffinct conceiving of them. Tho' some may fay that these things can be done by the conduct of Nature only, fince fometimes Persons perform them more exactly (who are ignorant of the Rules of Logick than they who have studied them, yet is not Logick to be judged useless, for Wifemen confidering the weakness of Mans Wit, Invented this Art to help us the better, by a just and natural Order to find out the truth of a thing, and tho' before Adam's fall, Knowledge was Natural, and came without Labour, yet no man can now of himself attain the Truth in all things without help, and diligent Learning. Who can deny but that the faculty of Painting is born with Man, and yet Art is necessary for the right forming of Images.

This Art is diffinguished by some into Natural and Artificial. All Men are endued by Nature, with a power of speaking, and framing of words, whereby a Man may discourse well, but yet without due Order. Artificial Logick, is acquired by use and practice,

and

and by certain Rules discovers all manner of Errors, Confusions, and Obscurities of our Conceptions, False and uncertain Judgments and undue Consequences in our Reasonings, the discerning and removing whereof is the whole Business of Logick: The other common Division of Logick is into Dostrinal and Practical. The first delivers the several Rules, directing us in Perceiving, Judging and Reasoning, the latter applies those Rules to use and practice.

Some Logicians divide this Art only into two parts. The first part called in Latine Judicium consisteth in framing of things aptly together. The second part consisteth in finding, and searching out matter, agreeable to the Cause, and in Latine is called Inventio, For when any one goeth to prove any thing he must first Invent somewhat to prove his Cause, in which Judgment must be used in framing the Reason so Invented, that he be sure it serve for the purpose.

Every Question is single or double, A Single Question restethin a single word as, What is Friendship? What is Philosophy? A Double Question stands in two Sentences; as, Is the Study of Philosophy Praise worthy? Or is it not? A Propositi-

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on is a Sentence uttered in plain words expressly, signifying either Truth or Falshood, and is either single or double. A Single Proposition is, Wicked Men care not to read the word of God, of which you may make a double Proposition by adding something thereto; as, Wicked Men not only cannot abide to read the word of God, but also seek by all means possible to overthrow the same.

Of the five Universals or Predicables.

As the Child beginneth with his Cross Row, and the Scholar with his 8 parts of Speech, so the Logician first and foremost professeth to know words, none of which but are comprehended under one of these Predicables or common Words. And to this end were they made, that every thing might be known in his kind, for when you go about expounding any matter, first you ought to begin with the Definition, thereby to know the nature of the thing; which cannot be done except the Predicables be first learned, for they shew the limits of words, how far they do extend, and how much they comprehend in The Predicables are, Genus, Species, Differentia, Proprium and Accidens. Genus

Genus is a General word under which divers kinds or forts of things are comprehended, as under a Living Creature are comprehended Men and Beafts; under Art, Logick, Grammar, Rhetorick, &c. Lapis a Stone comprehends in it felf a Sapphire, a Ruby, a Chrystal, a Turcois, a Carbuncle, &c. Every General word is confidered two ways; The chief General, in Latine Genus Summum and the middle General, in Latine Genus intermedium. The chief General as being supreme, can never become inferiour, so the Substance, the Quality, the Quantity are ever chief General words, and cannot be comprehended The middle Geneunder any other. ral or Genus Subaltern intervenes betwixt the highest Genus, and the lowest Species, as a Body, a Living Creature, a Precious Stone, the which three being compared with their Inferiours, are General words; being referred to their Superiours they are Species, that is to fay shapes, kinds or forts of things.

Species is a common word that is spoken of many which differ only in Number, as Man is spoken of Socrates, Plato, and of every proper Name belonging to a Man. Every Species is of two

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forts; The lowest or most Special, which is always spoken of every proper name, and ever is the kind, nor can it at any time be the General word, altho' it fometimes goes by that Name. other is Species intermedia, that is, the kind placed between the highest and the lowest, which at divers times, and by divers confiderations, may be both the general word and the kind, for that which is under the general word, that fame may be called Species or kind, that which comprehendeth other may be called the General word. A Noun proper is that whereof a kind is rehearfed; as, Cato est homo, Cato is a Man. In this Proposition Cato is the Noun proper, which belongeth to one Man only, and Man is the kind, which is more large, and comprehendeth all Men.

A Table shewing the order of every substance and kind as they are appointed by Nature may be seen in my Gen-

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Difference is an Universal which may be variously considered, 1. For as much as it is the constituent of Species, and then it may be Defined to be that whereby the Species doth exceed, or is

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more worthy than the Genus, as Man exceeds an Animal or Sensitive Creature by Rationality: 2. As it is something Pradicable, and so it is commonly defined to be an Universal, which is predicated of many different in Specie in the Question Quale quid, or of what kind of Essence a thing is, and this Definition agrees only to the interme-3. In as much as it diate difference: divides the Genus into differing Spe. cies; thus Rational and Irrational divide Animal, and Conffitute two Species, viz. Man and Beaft. 4. As it is an Effential part of the whole Compound, and so it makes a part of its Essence and belongs to its Definition: Wherein it differs from a Property and Accident, as being an actual part of the things to which it is attributed.

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Property is taken in a fourfold Sence.

1. That which agrees alone to the Species, but not to all the Species, that is to all the Dividuals reforting under it; as to Cure by Art is attributable to Man alone, but not to all his individuals.

2. That which agrees to the whole Species, but not to it alone; as, It agrees to Man to walk on two Feet; for the fame may also be said of other Animals,

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Animals, and yet not of all. 3. That which is attributable only, and to the whole Species, yet not always but only at a certain time; as, Grey Hairs to a Man waxing old, 4. That which is attributable only, and to the whole Species, and at all times, as it is the Property only of a Circle, of every Circle, and at all times, that all the Lines drawn from the Circumference to the Center, are equal. And this last fort of Property is that which constitutes the Fourth Universal, the other three Modes being rather referrable to Accidents, because they do not agree necessarily, nor always, nor to the whole Species, but contingently, sometimes and in part only.

Accidens is that which is not part of a Substance, nor doth stand by it self, but is understood that it may be, and not be in the Substance; that is may be away, and may be there sometimes more and sometimes less; as, Mirth, Sorrow, &c. in a Man; the Substance yet undestroyed, as a Man may be alive in whom these passions have been, but are not now. And altho no Substance doth altogether forsake, yet it doth often alter its Accidents, forsaking some

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and taking other; as, Water being placed on the Fire, alters its Coldness, and becometh hot, whereby we Judge that coldness in the Water is not a Substance, but an Accident. Accident is two ways confidered: Separable, as Frigidity may be taken from Water. Infeparable, as Stature or breadth cannot be taken from Man, nor heat from Fire, yet notwithstanding the heat of Fire is not separate from the Substance, yet the quantity or greatness is changeable, and feeing heat in other things may be feparated from the Subject, we judge Heat is another thing than the very Substance of Fire.

The Ten Predicaments.

A Predicament is nothing else in English but a shewing or rehearing what words may be truly joyned together, or else a setting forth of the Nature of every thing, and also shewing what may be truly spoken, and what not The advantage of these Predicaments are great, 1. whereas they are divided into Substance and Accident, we thereby know the Substance from the thing, which

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which is Accidental. 2. Of these general words ariseth this good, that if you will define any thing or shew the nature thereof, you may know where the word resteth, which would express the nature of another. 3. If a man beflow a little diligence herein, minding where every word is fetled, and knowing to which of all these most general words he may best refer it, he shall truly and foon know the Nature of all things. And this difference is between the five common words called Predicables, and these most general words called Predicaments; that the Predicables set forth the largeness of words, the Predicaments do name the very nature of things declaring substantially and really what they are. And fince the cause of Controversy may be the not wellunderstanding, or else the using of words which have a double meaning, all words ought to be confidered according to their Natures, and those only received and used for to maintain the Truth, whose name and nature is all one, and can be taken but in one fort, as Homo signifies no other thing but a Man; but if any word be used that is ambiguous or hath a double meanmeaning, restrain the largeness of it, and declare how you will have it taken, by which means the Fraud shall be foon avoided. Of words of many fignifications take this Example.

A Crown Signifies the Kings Crown, Crown of the Head, 5 s. in Money. A Noble | Signifies a Peer of the Realm, a piece of Money. Signifies the space of an Hour, Time Day, Year; and an Herb. Sage Signifies a Wiseman, also an Herb.

The Predicaments are in Number Ten, viz. 1. Substantia, 2. Quantitas, 3. Qualitas, 4. Relativa, 5. Actio, 6. Passio, 7. Quando, 8. Ubi, 9. Situs, and 10. Habitus.

Substance or Being which Cicero calleth Nature, is a thing that subsists by it felf, which Thing, Entity or Substance (for they are Synonymous) hath an Efsence, and Existence distinct from all betain other things and containeth Accidents which happen thereunto. Substance is Of twofold Created or Increated. Created Beings some are Intellectual, others

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vard ind ? others Corporeal. An Intellectual Being is a thinking Substance as the mind of Man; A Corporeal is a Substance extended in length, breadth and depth. created is a Substance independant of all other things whatfoever; as, God.

Quantity is the greatness of a thing, or the Number, and is two ways considered, t. Continua quantitas that is when the Question is asked how great or how broad any thing is, the use whereof is seen in Geometry. 2. Discreta quantitas when the Question is asked how many things there be and being occupied in Numbring the use

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Quality is a form or shape of the Boly, or Mind whereof some Name is derived as of Wisdom Men are called Wise. There be three manner of Quaities whereof the first doth contain the Habit, otherwise called the perfect having of any thing, as he that often Efpeaketh French shall by continuance all obtain perfection, he that writeth much that hall have a ready hand, and this is e is called Habitus. The fecond is a forwardness in any thing gotten by Labour ual, and Travel not given by Natures Boun-E 3

ty. The third is the full attaining of any thing as to be fully Learned and this last is two ways considered, of the Body and of the mind, Perfection gotten by help of the Body, is when a Man can Leap, Wrastle, &c. better than any other: of the Mind when a Man is vastly increased in Knowledge.

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Relatives are those, which are comprended with other, and have mutual respect one to another. All the Predicaments before are known without being compared with another thing, but Relatives cannot be well understood without Comparison. As when I say Father, I cannot understand him fo without he hath a Son, nor a Man a Schoolmaster without he hath Scholars. There is no word but we may confider the same to be a Relative, if we refer it to some other thing, and therefore we may go throughout all the Predicaments with this one place, and find relation of every one of them; but there are Re latives (improperly fo called) which are known, and have their being, even when they stand alone, and yet considered with other they have divers respects; as, Love is the Love of the thing Loved, or Love beholdeth the thing Loved.

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Loved. Blome faith, If we consider a Father and Son Materially without their Relation we shall call them Subjett, but if we consider them with respect to one another, we shall call the one the Relate, and the other the Correlate; because as the Father is related to the Son by Paternity or Fatherhood, fo is the Son to the Father by Filiation or Sonship, upon which account it is that Relatives are faid to be or exist naturally both together, because you cannot suppose the one without supposing the other. For supposing a Husband you must suppose a Wife too, and supposing a Master hemust have a Servant.

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A Table of Relatives.

As by the Cause and the Effect the Father and the Son are considered. By Nature. The Magistrate and the Mace, the King and his Sword car-By some manner or way used. ried before him are compared together. The Lord and his Servant, the Advocate and his Client. By Degrees in calling. By Kindred The Brother and Sifter. Relatives The Son in Law, the Mother in are com-By Marriage. Law. pared one with ano-The Grantor of a Leafe and the ther Tenant. By Covenant A Poet to be a Lyer, A Phy-fician to be a Man-killer, or By accidental happening. By Natural kind. a Lawyer to be a Thief. A Man, a Woman. A Young Man and old Man. By years. By Condition of A Poor Man, a Rich Man, a Life. Free Man, a Bond Man.

Action

Action is either Natural or Voluntary. That is called Natural which is done by the force of Nature as to beget, bring forth, to encrease, or Decrease. That Voluntary when a thing is done freely: as to teach, to read, to write,

Passo. Perpessio called in English a suffering, is the effect of the Action, and to make it plain is a Verb Passive, and the same which the Grammarians use; as to be taught, to be encreas-

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Obi is an Order or Predicament, which comprehendeth the Description of Places, wherein some thing is supposed or reported to be, has been, or will be done. As at London, Cambridge, at home, in a Chamber above, beneath, on the right hand, &c. and whatsoever is answered to this Question, when I ask where any thing is, or where any thing is done. This place serveth for Conjectures either in praising or dispraising.

Quando, This Predicament When containeth the difference, and diversity of times; as, nunc now, heri yesterday, noctu in the night time; this place also giveth light to confirm causes. As to

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prove that one is painful, I may fay fuch a one studies Day and Night,

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therefore he is a painful Man.

Situm esse is then considered, when a Mans Body is in any wife placed, as to lie aside, to stand upright, to sit,

to lean, to lie groveling, oc.

Habitus: Some call this Predicament, Habitus integumentum, that is a Covering or Appareling of any Body, as to have a Coat, wear a Gown, Harness, Shirt of Mail, Coat Armour. to wear Chains of Gold, Bracelets, Rings, &c. Thirdly to possess Gold, Silver, Land, Wife and Children, or to contain any thing as a Barn, Corn, &c.

The use and Commoditys of these Predicaments, is to teach you to define any word, and know the nature of the fame. As for Example, if you will know what a Man is, you must have Recourse to the place of Substantia, and there you shall learn that Man is a Living Creature, endued with Reason. If you would know what Vertue is, go to the place Qualitas where you shall see that Vertue is the constant Habit of a mind to good. If you would define the nature of a Father seek for Relativa, and

and there you may learn that he is a Father that hath a Son, &c.

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There is nothing more necessary in the whole Art of Logick, than to learn diligently the Definition, and division of every matter. A Definition is twofold, of a Word, or of a Substance. Division of a word, is when any word that fignifying divers things, is divided into every feveral fignification it hath; as, Canis into a Dog, a Fish of the Sea, and a Star in the Heavens. sion of a thing is three ways considered, as 1. When the general is divided into the kind, as Element into Fire, Air, Earth and Water. 2. When the whole is divided into parts, as the Body into the Head, Arms, Hands, Belly, Oc. a Man into Body and Soul, and this kind of dividing is properly called a Partition. 3. When the Substance is divided into Accidents, as of Men, some are free, some bond men.

There is another manner of dividing as, 1. Of Accidents into their Substances; thus, of good things some are of the Body, some of Fortune, &c. 2. When Accidents are divided into Accidents, as of good things, some are Honest, some Profitable, some Pleasant. And

there

there is an ancient Maxim worth remembrance. Qui bene distinguit, bene docet. He that doth divide well doth teach well.

We call that a Whole which confifts of many things joyned together or which hath parts into which it may be divided. That is called a Part which together with its Copart or with many of them, doth constitute a whole. word Cause is sufficiently known to all, but the Division of Causes is thus. The Material Cause is that out of which things are made or formed. The Formal is that which constitutes another thing, and distinguisheth it from all other as the Soul is the form of Man. The Efficient or Effecting Cause is that which produceth another thing; and the same is Manyfold. Total or Adequate which alone does produce the Effect excluding other Causes of the fame rank: as God Creating Adam whom he produced without the Concourse of any other. But a Father and Mother, or Male and Female are faid to be Partial Causes with respect to the Child they Generate. The Sun is the Proper Cause of Light, but only an Accidental Cause of the Death of a Man killed

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killed by too great heat. A Father is the Near Cause of his Son, but a Grandfather the Remote. A Mother is the Effective or Productive Cause of her Son. A Nurse is only the Conserving Cause. A Father is an Univocal Cause with respect to his Children because they are of the same Nature with him. But God is only an Equivocal Cause with respect to his Creatures; because they are of a different Nature from his, and in Dignity inferiour to him. An Artificer is called the Principal Cause of his Work because he Acts voluntarily; and his Instruments only Instrumental Causes because managed by him. Water that springs up into divers water-works in the Gardens of Princes, and which moves variety of Machines is the Universal Cause of their Motion; but the Artificial disposition and figure of the Pipes is the Particular Cause. Bodily things when they Act, are faid to be Natural Causes, because they produce an Effect from a Natural Propensity or Necessity: But Man is the Intellectual Cause of those things which he Effects by his Understanding and Will. A Man that walketh is a Free Cause because he Acts spontaneoufly

oully and not by force: But a Fire burning wood is a Necessary Cause because where those things are present which are required to its Action, as dry wood, application of them to the Fire, and Ventilation or Blowing, it cannot but burn them, neither can it exert any other Action instead of it. The Sun whilit it enlightens a Chamber is the proper cause of the Light that is in it, but the opening of a Window, or taking down of the Shutters, is only a Cause Sine qua non, or without which such an effect would not follow; which Cause is also called the Condition without which a thing cannot be. A Fire that burns Houses is the Physical Cause of that Burning or Confuming, because the Fire properly and of its own Nature burns. But a Man who fets Houses on Fire, or exhorts or commands others to do fo, is only a Moral Cause of this Burning, because he hath only Morally contributed to that effect, viz. by Exhorting or Commanding. Thus the Serpent or the Devil was the Moral Caufe of the Fall of our first Parents. The form which a Man proposeth to himself in going about to make a work is called the

the Exemplary Cause. The Final Cause is the end for which any thing is. Not-withstanding all these Causes, the Logicians reckon but 5 Genera or kinds of Causes, viz. The Material, The Formal, The Efficient, The Exemplary and the Final.

That is called a Subject to which fomething is adjoyned, or to which fomething accrues, besides its Essence. So Cloaths are put on the Body; the Soul of Man is joyned to his Body; Writing is applied to Paper; A Subject is sometimes taken for an Object, as when we say, to Subject a thing to

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That is called an Adjunct which is considered to be in a thing besides its. Essence, as something added, accrued or happening to it, whether the same bring along with it some proper Reality, as Fire in the Pores of hot Iron. A Concrete Adjunct denotes the accidental form together with the Subject, as White, Learned, Great, Great, An Abstract Adjunct is that which signifies only the Accidental or Modal form; as Whiteness, Learning, Greatness, wherefore an Adjunct is predicated of its Subject in the Concrete, Snow

Snow is White, Socrates is Learned, Great: But by no means in the Abstract, as Socrates is Whiteness; Learning, Greatness.

In the handling of any fingle Question, the Question should be eight ways examined; 1. Whether the thing be or no, as Is there any Law? 2. What a thing is, and this cometh from the Definition which is twofold: either of the Substance, or the name of a thing. The Name as a Realm is a Country ruled by a King. The Substance, as a Realm, is an Affembly or gathering of People together, being able to Live, and withstand Enemies. 3. Is when the parts and every feveral kind is confidered, and for this Question the Division and Partition doth much good. 4. What are the Causes, and especially what is the Efficient and what the Final Cause. The Efficient Cause of all good Laws, is God and his Minister. The Final Cause is to live upright in the fear of God. 5. When the Effect and Office is examined as the Effect of the Law is to Conferve the State of Man, &c. 6. When things be asked that are to follow, as we see much Neighbourhood and good Will to help the

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the needy. 7. What are Disagreeing. 8. To shew by whose Authority the

Law, &c. taketh place.

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A Proposition or Enunciation according to Aristotle is an Oration of Speech, which Affirms or Denies; or an Oration that fignifies either true or false. From which Definition it appears (faith Blome) that to every Proposition two forms at least are required; the one of which fomething is affirmed or denyed, which Term is called Subject, the other which is faid or denyed of another, which Term is called the Attribute, as when it is faid God is Existing, God is the Subject, and Existing the Predicate. Propositio Categorica (otherwise called a Single Proposition) is divided into true, and false Propositions. Propositio Hypothetica is a double Propofition, as, If Justice be a Virtue, it is praise worthy. There are also Affirmative Propositions, Negative Propofitions, and Universal, Particular or Singular Propositions:

Some Logicians make 4 kinds of Arguments, viz. A perfect Argument, An Imperfect Argument, An Induction and an Example. Others divide Argumentation in General only into Perfect and

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Imperfect. Imperfect Argumentation is a Syllogism, which forasmuch as it consists of three Propositions duly disposed is of a perfect form and most proper to persuade. An Imperfect Argumentation is either an Enthymene, an Induction, an Example, a Dilemma, or a Sorites of which hereafter. If there be just three Propositions in the Argumentation the first is called the Major, because in it the Major Term is disposed with the Mean or Medium. The fecond the Minor. The third, Conclusion in which the Minor and Major Terms are disposed.

A Syllogism being a perfect Argument there ought to be more words in the Conclusion, than was before Rehearsed, as for Example which Antonius maketh in the first Book of Tully

de Oratore.

Unprofitable things are not to be taught, In Philosophy are unprofitable things, Ergo, Philosophy is not to be taught.

This Argument is to be denyed, because there is more in the Conclusion, than was rehearsed in the two first Propositions. Some unprofitable things which It

which be in Philosophy are not to be Learned, not that Philosophy it self is to be rejected, for else this Argument would also stand good.

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logical ped actions Drunkenness is not to be allowed In Drinking is often Drunkenness, Therefore Drinking at all is not to be (allowed.

25 Labigard Com Syllogisms are Simple or Conjunct, and the Figures are three, the Modes reckoned 21, but reduced to 14. The Modes of the first figure are Barbara; Celarent, Darij, Ferio; of the second Cefare, Camestres, Festino, Baroco; of the third, Darapti, Felapton, Disamis, Datisi, Bocardo, Ferison, Examples of all which may be feen at large among the Logicians, as also the difference of Complex Syllogisms, Conjoyned or Compound Syllogisms, and Proportional or Analogical Syllogisms.

For the better knowledge how to place an Argument in Mode, Note, that in the Modes there are four Vowels to be confidered, viz. A. E. I. and O. A. fignifies an universal affirming, E. an universal denying, I. a particular affirming, and O. a particular de-

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nying Proposition according to the Common Distich, framed for to help the Memory.

A. Affirms, E. Denys, but Generally both. I. Affirms, O. Denys, but Specially both.

An Enthymeme is an unperfect Argument confisting partly of likelyhoods, and partly of infallible reasons, as

Such a Young Man talks often, and alone with such a Young Maid. Ergo, He is in Love with her.

This may be true and may be falle, but an Infallible reason is always true, as

Such a Woman is brought to Bed,
Ergo, She hath had the Company of a
Man: Or
The Sun is risen,
Ergo, It is Day.

An Induction is an Argumentation which from many Singulars concludes an Universal; as,

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Athanasius lived unmarried, Ambrosius lived unmarried, Basilius had no Wife, nor many more, Ergo, All Bishops heretofore were unmarried.

Which Conclusion Universal is not Lawful, for divers have been married in the Primitive Church, as, Spiridion, Hermes, Hilarius, Polycrates, Tertulian, &c.

Socrates's Induction was by asking many Questions, which being Granted, he thereupon brought his Confirmation;

as for Example,

How many Good People were there when the World was Drowned? Not past 8.

How many good when Sodom was burnt? Not 6 as appears, Gen. 18.

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How many in the Land of Promise, when 600000 fighting Men went out of Egypt, but 2.

How many bowed to an Idol in the time of Elias? All, but Elias and 7000.

How many Tribes of the Israelites followed God, but 2, the other 10 for-fook him.

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How many did the Lord count in the Land of Syria? But 2 Naham, and the Widow of Sarepta.

How many feared God when Tobias was persecuted? But one, viz. Tobias.

How many found Christ when upon Earth? But 12, and I was a Traitor.

Therefore may be concluded the Godly in all Ages are but small in Number.

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An Example proves one thing by another, because of a likeness of Reason that is between them, as Cesar subdued the People of Rome more by his Clemency than his Arms, from whence I gather and say, a Prince ought rather to have recourse to Clemency, than to Arms.

A Dilemma is a Horned Argument, whereby whatever you grant returns upon your self, and consists of repugnant Members, as If you Marry, your Wife will be Beautiful or Deformed, if she hath Beauty, she will make you Jealous, if Deformed you will loath her, therefore you ought not to Marry at all. A Dilemma ought to be used with Care, that it may not be retorted, which its said Protagora's did, to whom Evathlus his Disciple

Disciple having promised a certain Sum of Money in confideration of his instructing him in Logick, to be paid on that Day he should first get the better in the Cause he pleaded; and chusing that for his first Cause, to plead whether he was to pay that Sum of Money he had promised him, made use of this Dilemma. Either I shall lose this Cause or win it: If I lose the Cause then according to our agreement, I am to pay you nothing; if I win it, then I shall owe you nothing by the Sentence of the Judges. Which Argument Protagoras thus retorted. Either you will lose the Cause or win it, if you lose it you will by Sentence be ob liged to pay me; if you win it you must pay me according to our agreement.

Sorites is a heaping Argument where the last rehearsed word of the first Proposition, is repeated in the first part of the second Proposition, necessarily agree-

ng thereto, as

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Where the Law is, there is Transgression, Where there is Trangression, there is Fear, Where there is Fear, there is Remorse of Conscience,

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Therefore where the Law is, there is Remorse of Conscience.

No Arguments be made Negative by this kind of Argumentation, as

The Gospel is not the Law,
The Law teacheth us the Fear of God,
Therefore the Gospel doth not.

Fish is no Flesh,
Flesh is Meat
Therefore Fish is none.

Disputation is when certain Persons debate a cause together, opposing each other, in which, each ought to stand close to his Argument, and by the Rules in the first part of Logick, and his Wit, and the use of the second part of Logick called Invention, he may so open the Truth as to give full Judg. ment to the content of both, but all possible care is to be taken, that there be no Errors in Words, or Phrases, &c. In the words are these following, I The Doubtfulness of Words. 2. The double meaning of a Sentence. joyning of words that should be parted. 4. The parting of words should be joyned

ed. 5. The manner of Speech. 6. The Accent.

For an Example of the Ambiguity of Sentences, and doubtful writing which by reason of Pointing may have a double Sence, I shall insert these following Verses taken out of an Enterlude made by Nicholas Udall, about 150 Years ago, desiring the Reader to excuse the English being according to that time.

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Sweet Maistress, whereas I Love you: no-(thing at all

Regarding your Riches and Substance: (chief of all

For your Personage, Beauty, Demeanour (and Wit

I commend me unto you: never a whit Sorry to hear report of your good Welfare, For as (I hear say such your Conditions

That you be worthy favour; of no living
(Man

To be abhorred; of every honest Man To be taken for a Woman, enclined to (Vice

Nothing at all: to Vertue giving her due (Price

Where-

Wherefore concerning Marriage, ye are (thought Such a fine Paragon as ne'er honest Man (bought, And now by these Presents I do you ad-(vertife That I am minded to Marry you; In no (wife For your Goods and Substance: I could (be content To take you as you are. If you would be (my Wife You shall be assured for the time of my I will keep you right well: From Good (Rayment and Fare You shall not be kept : But in sorrow and (care You shall in no wife live: At your own (Liberty Do and fay what ye lift; Te shall never (please me But when ye are merry: I will be all Clad When ye are forry: I will be very glad When you feek your hearts ease: I will be (unkind At no time: In me shall ye much gentle-(ness find.

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But all things contrary to your will and (mind Shall be done otherwise: I will not be (behind To speak: and as for all them that would do you wrong I will so help and maintain, ye shall not (live long Nor any foolish Dolt shall cumber you; (But I I (who e're say nay) will stick by you till (I dye. Thus good Maistress Custance the Lord (you fave and keep From Roister doister whether I wake or (Reep Who favoureth you no less ye may be Than this Letter purporteth which ye (have unfold.

The Contrary Sence in the fame words.

Sweet Maistress whereas I love you no(thing at all
Regarding your Riches and Substance
(chief of all.
For your Personage, Beauty, Demeanour
(and Wit,
I commend me unto you never a Whit.
Sorry

Sorry to hear report of your good Wel-(fare, For (as I hear say) such your Conditions That ye be worthy favour of no living (Man: To be abhorred of every bonest Man. To be taken for a Woman enclined to (Vice. Nothing at all to Vertue giving her due Wherefore concerning Marriage ye (thought Such a fine Paragon as newer honest Man (bought. And now by these Presents I do you ad-(vertise, That I am minded to marry you in no (wife. For your Goods and Substance I could be (content To take you as you are. If you will be (my Wife Te shall be assured for the time of my I will keep you right well from good Ray-(ment and Fare, Te shall not be kept but in forrow and (care.

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Te shall in no wise live at your own (Liberty, Do and Say what ye lift ye shall never (please me. But when ye are merry I will be all (Sad, When ye are forry I will be very glad, When ye seek your hearts ease I will be (unkind. At no time in me shall ye much gentle-(ness find. But all things contrary to your will and (mind Shall be done: Otherwise I will not be (behind To speak: and as for all them that would (do you wrong I will so help and maintain you shall not (live long. Nor any foolish Dolt shall cumber you I (who e're say nay) will stick by you till (I dye. Thus good Maistress Custance, the Lord (you fave and keep From me Roister doister: Whether I wake (or sleep

Who

Logick.

Who favoureth you no less, Te may be (bold, Than this Letter purporteth which ye have (unfold.

An Example of joyning words that should be parted, called Conjunctio distrahendorum:

Whosoever knoweth Letters now hath learned them.

A Grammarian knoweth Letters:
Etgo. a Grammarian now hath learned them.

In which the Adverb (now) should be referred to the first point, as

Whosoever knoweth Letters now, hath learned them.

A Grammarian knoweth Letters now: Ergo, a Grammarian hath learned them.

An Example of parting words that should be joyned, called Disjunctio conjunctorum.

The Law and the Gospel are two divers things.

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The Word of God is the Law and the Gospel.

Ergo, the word of God is two divers things.

Secundum non causam ut causam is a Cause that is not put for a Cause; Or is when a Cause is brought in that is not able to prove the matter, but the Ground being considered the fault is easily found; as,

Drunkenness is Evil: Ergo, Wine is naught.

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Another Example.

Paul warned us we should not be deceived by Philosophy: Ergo, Philosophy is naught some will say.

Wherein he only reproved the abuse not the use of Sciences. And there is a Rule, A posse ad esse non est bona consequentia, which is, because a thing may be, it shall not follow that it is.

Plures interrogationes, is when by many Questions you intend to deceive any one, or bring him to an inconvenience by his former granting some particu-

lar

lar things, and it is two ways confidered. First when we ask of many things one, and again of one thing many things, and put forth divers Questions before we come to the purpose. Example of the first, Is Water and Wine hot or no? This Question is asked so that he must answer to them both, which he cannot do at one time, but taking this distinctly it is easily answered. An Example of the fecond take in this following Story. A Gentleman promised a Lawyer (for his pleading a Suit of his) a Horse, which when the Lawyer claimed, the Gentleman nyed the Debt and Argued thus. Horses are not of one Colour, but different, some black, some white, some Bay, some Daple, if I owe you any by Promise, I owe you none of one Colour more than another, and as I promifed you no more of one Colour than another, I may be discharged as well in delivering a Horse of one as another Colour. Therefore I owe you Horses of all Colours, or else I owe you none at all: but I do not one you Horses of all Colours (considering I promised you but one) therefore I one you none.

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Repetitio principii, The Cuckoes Song is repeating of that wholly in the Conclusion which before was only spoken in the first proposition; or else by things doubtful to prove things that are as doubtful, as

Every Slanderer must be Banished the Court.

Such a Man is a Slanderer:

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Ergo, every Slanderer must be Banished the Court.

The Conclusion is not well gathered for it should not be Universal but particular.

Ignoratio elenchi (that is the mistaking of contradictory Propositions) is a deceitul Argument. The reason of which Error riseths from not knowing what is Contradiction: Contradiction therefore is a Repugnancy of one and the same, not Substance only, nor yet Name only, but of the Substance and Name together. This Deceit is used when Contradiction is made, according to divers Respects; is thus,

The

The Law is to be followed in Moral Precepts, and not in Ceremonials, nor yet always in Judicials neither. Ergo, The Law is to be followed, and not to be followed.

Another Example.

To work upon the Sabbath is forbidden, and yet not to work upon other Days is also forbidden:

Ergo, to work and not to work, are both forbidden.

It is easy to avoid these Deceits. Therefore is there this Rule in Logick, That two Contradictions can never be both either true or false at one and the same time.

Crocodilites is such a kind of subtlety that when we have granted a thing to our Adversary, being asked before what he will say, the same is by Argument converted to our harm.

Antistrephon is in the Nature of a Dilemma, and may be understood the same.

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Ada is n Cacofistata are such Arguments that being proponed between two Persons, they serve as well for the one as the other, as You must forgive him because he is but a Child, No marry therefore will I beat him, because he is but a Child.

Alystata are such Arguments as are impossible to be true, as A Child two

years old accused of Adultery.

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Pseudomenos is a lying Argument, for whatsoever is said, must be amiss, as Epimenides a Cretan said, the People of Crete were Lyers, if they were so, then Epimenides lyed, and his saying was not true, if they were not lyers, then Epimenides said truth, because he himself was a Man born in Crete.

Note, No Man ought to argue on things which to doubt deserves Punishment, as to reason whether there be a God or no. Secondly it is ridiculous to reason of those things which our Senses judge to be true, as whether Fire is hot. Thirdly it is evil to reason of unnecessary things, and which cannot be known or resolved, as what God the Father is in Person, what hour he put Adam into Paradise, &c. Fourthly it is needless to dispute of things undoubtedly

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edly true; as in Arithmetick three and three make fix.

Blome in his Institution of Philosophy faith, there are many things he cannot approve of in the Constitution of the Predicaments in Logick, First he faith the Logicians divide Ens into Substance and Accident without any reason, for as much as an Accident is no Entity. Secondly in that they constitute Nine supream Genera of Accidents, viz. Quatity, Quality, Action, Passion, Relation, When, Where, Situation and Habit. Where first (saith he) they mistake in this, that they make those to be the supream Genera, and distinct too, which truely are not so, as Quantity and Quality: For the greatest part of Physical or Natural Qualities arise from Quantity, Figure and Motion. Secondly Relation doth not in the least belong to the Genealogy of things, because it is no absolute thing, but only an affection framed by reason, viz. an opposition with or under some respect. Thirdly Action and Passion in Bodies are reducible to Motion, whose Species or Modes they are. Fourthly the division of Ens into Substance and Accident invented by

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by Aristotles, deviates from the Rules of a good Division, because the parts of it are not opposite. Fifthly if any attributes be found amongst them, the same may be more fitly deduced from other Genealogy; as for Example, Quantity belongs to the first Mode of an Extended Being. Quality, if it be mental to the Modes of Intellection and Volition if it be Physical or Corporeal, to the fifth Mode of an extended Be-When and Where ing, or to others. to Duration and Place, which are the general attributes of things. Situation is the Mode of an extended thing, the respect of one Body to others, considered as near to it. And Habit is the Common Adjunct or Accident of of some things, as of a Human Body or some other. See Blome, Part I. Ch. 8.

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Cornelius Agrippa in his Vanity of Arts and Sciences, faith, Logicians promise to find out the Essential difference of every thing, but cannot render themselves Masters of their word, in making things so clear, but that they may be asked why they cannot well call a Man, a Man, as Animal Rational, or a Mortal G 3 Rati-

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Rational Creature, more of which may be found in Boetius, whose works are not esteemed, but yet are beyond all the Predicaments, Topicks, Analyticks, and other Trifles of Aristotle, whom the Peripateticks following, believe nothing can stand or be known unless by his Syllogisms, who never observed in all his Maxims, how all his Arguments are deduced from suppositions or things granted before. It is a certain experiment of the truth of Speech, as Averroes faith, when the words agree with the things thought: And that is most known to the Knowledge of which most Senses concur. Where is the Fruit of this Scientifical Demonstration (saith Agrippa) which when we are forced to confent to, will be things rather perfectly known than Demonstrated. By help of their Ten Predicaments which they call most General Genus's they hope to comprehend and understand all things. To which adding five Predicables so called, because they are Predicated of themselves, and of their parts. And affigning four Causes of every thing, They Compound

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pound every Syllogism or Demonstration, of three Terms. The first is the Subject of the Question and is called the Major; the second is the Predicate of the Question and is called the Minor; the third is middle participating of both. With these Terms they form two Propositions which they call the Premises, out of which at length springs the Conclusions. is that Egregious Engine and these are Terms, and parts thereof by which they undertake to joyn, divide, and conclude all things by help of certain Axioms which they dream impossible These things are the to be refuted. deep and profound Mysteries of Artificial Logick, invented with fo much care by these Fallacious Doctors, and are not to be exposed, or learnt by any. but those who are able to be at great Expences, and give great Rewards to purchase Authority among the Schoolmen. See the Vanity of Arts and Sciences in Logick, 41. 42.

Feltham in his Resolves, saith nothing hath spoiled Truth more than the Invention of Logick. 'Tis reason

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drawn into too fine a thread, tying up Truth in a Twift of Words, which being hard to unloofe carry her away as a Prisoner; That it is a Net to entangle her, or an Art Instructing you how to tell a reasonable lye. When Diogenes heard Zeno with fubtle Arguments, proving that there was no Motion, he fuddenly starts up and walks. Zeno asking him the cause, Diogenes answered, I but consute vour Reasons. The fame Diogenes having once heard Plato to Define a Man, to be a living Creature having two Feet, and without Feathers. The Definition not being plain and open, took thereby an opportunity when Plato was earneftly teaching his Scholars, to clap into the School a Cock with all his Feathers plucked off, Crying, Lo! Behold Plato's Man. Truth in Logical Arguments is like a Prince in a Masque, where are so many other presented in the same Attire that we know not which is he, and as we know there is but one Prince, fo we know there is but one Truth, yet by reason of the Masque, Judgment is distracted and Deceived. Nature her

her self makes every Man a Logician: they that brought in the Art, have presented us with one that hath over acted her, and something strained her beyond her genuine plainness. See Feltham's Resolves, Page 172. 173.

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RHETORICK.

Hetorica in Greek puropika, a péw i. fluo, acsi dicas, affluenter loquor, or the Art of Eloquence, being a Collection of Precepts from whence proceed the flourishing varnishes of fine Language, and the perswasive power of Oratory, of fuch force as to allay or incite the affections of Men, and Charm even Truth it self asleep; So Demothenes used to boast among his Friends, That he could fway the opinion of the Judges by vertue of his Eloquence, which way foever his will and pleafure inclined him, and for that reason, Cicero was at Rome called King because he rul'd the Senate wholly by his Orations, and wrought their minds to his purposes just as he would himself,

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it being a Magick to the Mind, subduing even Tyrants in their Anger, and gaining Conquest over our firmest resolutions, according to that of the Poet.

Thou mayst give Smiles, or Tears which joys will blot;
Or Wrath to Judges, which themselves have not:

A good Orator should pierce the Ear, allure the Eye, and invade the mind of his hearer. But before I proceed to the parts of Rhetorick it will not be amiss to let you know that

All Discourses are either of Persons, Things, or Facts. In Persons are considerable their Descent, Nation, Countrey, Sex, Age, Fortune, Manners, Education, Relations of Father, Brother, &c. In Things,' (that is Substances and Qualities) the Ansst, Quid sit, Quale, Quotuplex, &c. its Genus, Species, Properties, &c. In Facts the Cause, Place, Instrument, &c. In Gross for all Subjects, Proofs are derived from Persons, Causes, Times, Places, Antecedents, Consequents, Efficients, Effects, Events, Conjugates, Similies, Con-

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Contraries, Comparison, with Things Greater, Lesser, Equal, from Correlates, Examples, Suppositions, and Reduction, ad absurdum (as is used in the Mathematicks) to a consequence that all grant to be false; from their Genus, Definition, Division, &c. The Natural parts of a Discourse are, 1. An Exordium or Preface. 2. Declaring and proving the Positions. 3. Resuting the contrary. 4. A short Recapitulation and Conclusion, called Peroratio.

The Parts of Rhetorick.

Rhetorick may be divided into two chief parts, viz. Elecution and Pronunciation, for Invention, Style, Words, Ornaments of Speech, Figures, &c. are but parts dependant thereon, and serve but to refine and model the Discourse.

Elocution is a proper and good utterance, or an Elegant order of words and Sentences, for the true attaining of which we are to take great notice of

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The ornaments of Speech called Figures, necessary for the adorning Orations, and Modes of lively and more passionate expression, as well for the setting out any matter more spaciously, as to render the Theme more vivant and plausible, and with a grave and due decorum of words to incline, soften or perswade. Such are,

1. Epithets very useful, especially in Descriptions and Metaphors, without which Speech seems naked, and with too much is burthened, causing harsh superfluity of like Terminations, occurring soon in the Latine Tongue, but not in the English, who have a more dexterous decomposition of two or three words together, as [Heaven-blest—Seathron'd-Thetis—God-like-goodness].

2. Metaphors (used chiefly in descriptions) are Similitudes of words, whereby we endeavour to paint a thing to the Auditors sence with more Illustration and significancy than the bare word it self seems to have, as Man is called Microcosmos or the Little World.

3. An Allegory is a long profecuted Metaphor. As [The Common Lawwould punish Treason in the very heart, if the Eye of Inquisition could extend so far]

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By some an Allegory is accounted a dark Speech, or a Sentence with a double

understanding.

4. Similitudes are various, for Poetical Fictions, Apologues or Fables, &c. are called Similies. But a true Similie bears some affinity with a thing expressed. As [Vessels never give so great a sound as when they are empty] which may be applyed to a Man who makes large Flourishes upon little matter. Dissimilitudes or Comparisons with, and Illustrations by contraries are thus [each place handsome without curiosity, and homely without loathsomeness].

5. Amplification is an enlarging and may be done many ways, especially, 1. By repetition. 2. By multiplication of the expression, whereby you form the thing in divers shapes, which is an excellence in Rhetorism. 3. By enumeration of parts, i.e. of all particular Circumstances, Antecedents, Consequents, Adjuncts, Causes, Effects, Matter, Form Time, Place, &c. Under this fome comprehend Ethopæas and the decyphering and character of Manners, Passions, Moral habits, &c. as well as of any other works of Nature. As [of 4 Fountain, an Earthquake] interpretation

tion or Comment, by way of Parenthe. fis, is very common in this part of Amplification. 4. By Atiologies or giving reasons for what is said. And Note the Rhetorician or Orator discourseth and argueth as the Logician by Syllogisms or Enthymems, Inductions and Examples only in a little different manner. Proving the Premises (where weak) as he lays them down, before he infers his Conclusion from them, and if the discourse be long, making a repetition of the Premises. As in that instance in . Cic. de Inventione. 1. To prove the World governed by Providence he shews first. That the best governed things are ruled fo, then proves this in a House, a Ship, or an Army; far better managed where there is advice, Dr. Then next shews that the Heavens, Earth, &c. are as wifely and regularly ordered as any of these, proving this again from the constant course of the Stars, &c. and thus descends at last to his Thesis or Conclusion.

6. Metonymie is a Transnomination or using one name for another, as [This Ring is Right Alphonso, for, of Alphonso.

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derstood by the whole; or the whole by the part, the General for the Special, ecoutra. As for the first let this example suffice [I am censured by many Tongues, for many Men.] Contrariwise for the second [The World is all Censure, for many Men use Censure].

8. Catacresis, is when a word is abusively put for another. The Poet by this Figure takes the liberty of inventing words often, the sometimes

foreign to the matter.

word, or words, by repetition, without the interpolition of another, and is feldom or never used but in Passion, as [O mercy, Mercy I Crave, &c.]

bearing this difference from the other, that this is at the end of a former Sentence, and beginning of that that

follows.

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where after many propositions, the first Subject and last Prædicate are joyned, which may be with an Ergo, as [Ergo you cannot hope to win that Woman which ever avoideth men.] And in this Figure the last word or some one word,

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in the last Sentence doth often beget the next Clause.

ning of every Sentence the fame word is repeated, as [Thou that did, &c. Thou that hast, &c. Thou that refuseds, &c.]

13. Epistrophe is when many Clauses conclude with the same word, as [Thou whose Aim is at Riches, whose slavery is for Riches, that thinkst all happiness consists in Riches, &c.

14. Epanadiplosis is when a Sentence beginneth and endeth both in a word.

15. Epanalepsis is a Repetition after

a long Parenthesis.

16. Epanados is when two things rehearfed together are spoken of afterwards severally, and Epanaphora is the same with Anaphora before.

17. Antimetabole or Commutatio is a Sentence inverted or turn'd back, as [You are the Son of a good Father, and may be the Father of a good Son.]

18. Paranomasia is a running upon oneLetter very much that begins words; as [O Tite Tute Tati tibi tanta Tyraum tulisti,] and [Rhimes running in rathing rows.]

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19. Agnomination of Syllables is to be understood by this Example [A Man as good at Fasting as Feasting, and hath a Wife loves to have comfort as well at Bed as Board.]

petition of words of the same lineage, that differ only in Termination, as [Exceedingly, Exceeding,] and the like in other Cases with difference of a word; as, for Love, concealed his Love, &c.

21. Comparisons are of things contrary, or equal, or things different, which need not be here explained, being easi-

ly understood.

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expressing a thing Superlatively beyond the Truth, that in Descending you may find the Truth. Sometimes in slat Impossibilities that you may rather conceive the unspeakableness than the untruth of the Relation; so saith Mr. Blount who giveth this Example of the latter [Though a thousand Deaths followed it, and every Death were followed with as many Dishonours; the World sooner wanted occasions, than he Valour to go thro them.]

23. Paralepsis is when you say you let pass that which not with standing you

touch as full.

H 2 24. Asyndeton

24. Asyndeton is when many words are joyned together without a Conjunction, nt [Veni, vidi, vici, pro Veni & vidi & vici.]

25. Zeugma is where many Clause

are joyned with one Verb.

26. Prosopopæia is where you suppose or feign the Dead to speak, as [Went your Father alive, and saw you commit so, &c.

would be not say thus -----.]

our Speech from the Judge or Personsto whom we speak, to some that are Absent, or sometimes present, as to People or Witnesses, Interrogating and Intreating em, as [Did you mark his looks! Did you note his behaviour?] Intreating as [Let me request any present to imagin himself in my Case, &c.]

For many Examples of these Figure and others much more easier to be under stood, as Interrogation, Exclamation, Accumation Diminution, of Sentences, &c. I refer you to those Books which treat there

at large.

Words ought to be chose that are most Polite, for any Oration or Discourse So Mirror runs sweeter than Looking glass, and words least common, so their rarity are more observed (the

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ometimes fooner forgotten) those derived from the Latine merit preference of any of the Saxon English. So Intervene sounds better than come between, and the like of many other Latin Compounds, yet some English Prepositions may be prefixed at pleasure, Seneca's ppinion is, Fit words are better than fine ones.

Too many Confonants or Vowels coming together are to be avoided, as causing an ungrateful Sound, and words of extraordinary length, as well as Monofyllables (where Polyfyllables may be had) are to be rejected, the irst making the Language dull and low, the other by reason of their maby Confonants abrupt and hardly luent.

Tautology or the often Repetition of one word, is by no means to be used or furely the Oration is most powerul where the Tongue is diffusive and peaks in a Native Decency even in every Limb. So also

Circumlocution or many words are to be avoided where fewer will ferve, and be as expressive, for long compased Language unless very judiciously made will rather pain than ple se the

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Omoptota's and words of like Termination being a found next to Tautologies are to be severed to a certain distance, and where they cannot, to be omitted, for as divided they make in the Sentence a sweet and grateful Rhime, so concurring they have a harsh and jar-

ing Accent.

The weightiest words should be placed in the beginnings and ends, because they make deepest Impression, there being some stay still before the one and after the other. Therefore as usual to commence with Things rather than Persons, with the Accusative rather than the Nominative which also may have more reference to what next precedes. And to conclude with that, without which the Sence is not perfect (to keep the Auditor in an Attentive suspense until all is said) and upon which the rest chiefly depend.

Transposition of Words, are more incident to the Learned Tongues, yet the Modern are not wholly destitute, tho seldom used, and then rather by

Chance than Design.

A Multifyllable better answers a Monofylnofyllable precedent, than a Monofyllable be w of

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lable a Multifyllable, yet Monofyllables correspond better to Monofyllables, as the words Fear and Love correspond better than Fear and Affection, and words of like Cadence better than of a different, as the words Experience and Science correspond better than Experience and Knowledge.

Synonymous words are words having fignification alike, as [Ensis, Mucro,

Gladius, a Sword.]

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Style ought to be varied according as it is prepared for the Ear, or for the Eye; for an Auditor or fora Reader. An open and free Style is necessary in speaking, a stricter in Writing but in the latter must be used great Caution and Decency according to the matter you handle or Man you write to, for the same Schemes become not a History and Panegyrick, a Letter and an Oration, a Controversy and Moral Discourse, a Poem and a Fable; in some must be used losty Metaphors, frequent Interrogations, &c. while others must have more serious Language, some must be Heroical, others Submissive, some Smart, others Grave, some Jocund, others sober. All of these having their Graces and Defects, some suiting with Rear H 4 fons, fons, others with the Passions best. One being sweet, another powerful; some more Learned, but others more Natural and unaffected. In all which you should addict your felf rather to that Stile to which your Natural Abilities incline you, and endeavour a suf-

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ficient perspicuity therein.

. In all Compositions after the last hand added to the Style, yet ought there to be an audible recitation to try whether the words be well placed, and the Numbers well fitted, and to found them distinctly, and as you would do before an Audience. To take the experience of your Voice also (and after the contrivance of them in the Brain, and the examining of them again, when fet down in writing by the Eye) to bring them at last by their Sounds to the Test and Tryal of the Ears, in which if the Oration please not, it is much less Effective on the Passions. This Office Pliny the more exactly to perform, procured his own Compolions to be recited to him by some other than himself. Nor is it improper or inconvenient to try them before a Friend or Company, fince those that are short in Fancy may yet exceed in Judgment 0

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and Pliny's diligence herein may be feen Lib. 7. Ep. 17. For none is an Orator And undoubtto himself but others. edly the Rhetorician ought well to consult the order of his Stile, for the Beauty of it confifteth principally in this, That he make not a fair Entry and Introduction to lose his Vigour and Faculty prefently, profecuting Argument faintly, and ending it more coldly, but it is requisite that he so proceed that by little and little his Stile and Method grow into more Grace and Majesty, for they that do otherwise, as faith Joshua Silvester, retemble violent Winds which by little and little abate themselves, after their first furious Blusterings are past.

Extemporal Eloquence must be careful to use a long and compassing Stile that whilst he slowly Essunds what is already prepared in his Memory, the Fountain of his Wit may have the more time to replenish it with more, and never suffer himself to be quite Exhausted, therefore such ought to make use of Metaphors, Similies, and Descriptions, and Paraphrase upon their Matter and Digressions, and not be too Concise for acute Sentences and

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florid Discourse, but rather strive to imitate Tully than Tacitus. Nor must they be too curious for Transposition of words for the Emphasis or Numbers fake from their natural place, nor take too large a Random for fear they lose their Subject, or by too much o'erburthen their Memory, the sence also suffering much Obscurity from that length, nor does it fuffer less prejudice from Parenthefical Sentences, whose interpoling does disjoynt the Discourse, and disproportion the matter to the Auditor, fo as to leave in him an imperfect Impression. And altho' our Luxuriant Wits (affecting Brevity) often make use of Parenthesis in their Writings, yet too many, or too much in one of them may easily disturb the uniformity of Style, and prove sometimes an Enemy to the Readers Understanding. Tho Parentheses are not half so troublesome to a Reader as to an Auditor because they are marked out in the Paper to the Eye, but cannot be so in the Voice to the Ear: Therefore in Compositions intended to be spoken they are much more carefully to be avoided.

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For the Acquiring of Eloquence and good Stile you ought to be familiar and frequent in the reading not only of the Rhetoricians and Orators Books. but also conversant with the Elegant Historians, from whom you will find no small improvement, no less encouragement to imitate their excellency of Stile, not relying too much, nor yet rejecting the exercise of your own Invention, in which take care of torturring your Fancy too much at first, either in overcurious matter, or fetting it down in the most exact form. besides that the Mind doth more heavily and less accurately perform many things at once; the Wit especially is of fo delicate a sharpness that any forcing presently turns the Edge. So many things are as easier so sooner done feverally than at once: as our Strength, in Parcels quickly takes up the Weight which united in one we cannot poffibly move. Let your Invention therefore work with Liberty and no Restraint, and let your Stile be furnished with folid matter, and compact of the best, choice, yet most familiar words, which many times natively fall in, to matter

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matter well contriv'd according to Horace in Arte Poet.

Rem bene dispositam vel verba invita

To matter well disposed words of themselves do fall.

Whatever Stile you entertain befure you endeavour a sufficient perspicuity therein; which as it ought to be the chiefest care of a Rhetorician (the defign of whose speaking is certainly to be understood) so is it often hindred by the Ornaments of Speech, you are not every where to use either flourishing Metaphors, as fome of our Moderns; or grave Sentences, as Seneca, or acute and exactly according Periods, as Tacitus; or sweet and consenting Cadences, as Isocrates, but interchangeably something of them all, that each Auditor may be delighted with fomething fuitable to him, whereby the Audience will be pleafed and the Orator be commended. But now referring you to Aristotles Rhetoriques, ralfo Butler's, Farnaby's and others for your further Improvement in this first part of Rhetorick

torick I shall proceed to say something of the second part, which is Pronunciation and Action.

Pronunciation ought to be accompanyed with some decent Action and Comportment of the Body. In speaking let your words be laid down distinctly, which not only giveth a Grace to the Speaker but helpeth the Memory of the Hearer, yet the heighth, length and distance between words are still to be varied, some being to be spoken higher, some lower, some swifter and with some force, some slower and more mollified, else nothing faid is made more confiderable than another, and perpetual variety and change in Pronunciation yields a delight to the Ear, as well as great ease and refreshment to the Voice, what gives Singing fuch a ravishing power over us but a well proportioned variety of Notes? Or what advance the Verse above Prose but a perpetual change of the Feet? Always take care to begin in a Middle Key that your Voice may have its true Compass, as the words and Passions do require, fo may you either raise or depress your Notes, else put in a Base how can it descend or ascend in a Treble.

ble. And as a Singing Tone and Verse. like Cadence are always to be avoided, fo Monotonia or the same continued Tone is by no means to be used, and tho Ease and Modesty incline some to a low Tone, yet ought it not to be practifed making but a weak impression upon the Auditor, and is by fome accounted worse than the other extream of a loud Voice; which yet ought not to be too raging, thereby interrupting the Grace and smoothness of the Difcourse, and filling the Ear rather with found than Sence; great care ought also to be taken in the delivery of your words that you strain not too much just before a Conclusion, thereby drowning that which follows, for the Articulation of each Syllable ought to be with fome (more or less) distinction, and in fuch a Key as that all may be perfeetly heard and clearly understood, and particular Regard is to be had to the true Emphasis or Cadence of a Word, and the true disposing of a Sentence for some words flow not so gracefully in one place, as being polited in another, as this Verfe.

In the Summer of thy favour these grow.

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These in the Summer of thy favour grow.

Those words which the Voice is chiefly to stay upon and give an extraordinary Emphasis to, are such in which there lies some Figure, as all Annitheta's and Correspondents and words relating to another, and generally the Mediums (in which lies the greatest Burthen) of our Arguments.

Action is especially of the Eyes and Right hand. Of the hand, thus Scaliger. Ratio est manus intellectus; Oratio Rationis; Orationis manus & manus membrum hominis loquacissimum. The hand helps to keep time in Speech, the several Motions whereof I find thus stated

by a certain Author.

The hand is to be held out when we speak of Begging: Up when we speak of Praying: The hand beating on any thing, is used when a thing is spoke of Anger: Clapping the Hands together when speaking of Wonders: Opening one or both hands, when making a thing

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thing plain or explaining: Arms drawn back close to the fides, when requesting: Putting out the Forefinger when demonstrating and as it were shewing a thing (therefore is that Finger called the Index,) The first Finger turned down for urging and pressing as it were: Put up for Threatning: The middle Finger put out for reproaching: The left Thumb touched by the Index of the right hand for reasoning and disputing: The touching a Finger with the other hand for Diftinguishing and for Numbring: The band brought towards one in faying any thing of himself: towards the Head when speaking of the Understanding: to the Breast when of the Soul, Will or Affections: Folding the Arms in fadness, Oc. Yet must a Rhetorician and Orator be cautious of too much Finger Action, being not grave; he must be free from any Imitations of Levity as of a Fidler, Dancer, &c. he must not indecently extend his Arms too far any way either upward above the Eye, or downward below the Breast, or much sideways, or backward or circularly. He must turn the Action of the Hand the same way as the Voice. He must withdraw and end the Action of his Hand with

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thind ith hand with his Sentence and in the same Sentence must not often change it. Lastly he must avoid all affected. Gesture and screwed Postures, and use his lest hand but when it needs, which is but seldom?

And now for the Readers fatisfaction and delight I will infert three small Orations made by three young Students who spoke them in the year 1671.

An Oration in Praise of Publick Schools
above Private.

Gentlemen and Ladies.

There is a great Controversy this Day to be decided concerning Schools, Whether Parents had best to educate their Children in Publick Schools or Private. If I may speak my mind in this place without offence I would give the Preheminence to Publick Schools, and have a perfect Number of Reasons for it, that is, Seven, and I hope my Reasons are as perfect as their Number.

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First. The ablest Masters are in Fublick Schools (at leastwise we need not fear to say so,) for who that is Master but of a Private School, will

be fo Presumptuous to compare himfelf to one of them, any more than a

Petty Prince to compare with the

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Grand Seignior.

'Secondly. Publick Schools make the best Scholars, great Linguists, brave Orators, excellent Poets and what

'not? When they come to the Univer-

' fity are they not like Children that are born very Great, of which they use

' to fay that they are half brought up

' fo foon as they are born.

'Thirdly. In Publick Schools there is the greatest Emulation, which make

fome Boys tug at their Oars like Wa

termen that Row for a Wager, and frain their parts as Lutanists some

times do their strings, till they eve

Crack again; and whet the Edge of

their Souls till it be ready to cut the Scabbard of their Bodies.

'Fourthly. It is a great Reputation to be of a Publick School, and to

'Captain in fuch a School is to be

little Vice Chancellor: All the Mi

chief is every Boy hath not Cap

vis ligno non fit mercurius. Every Stick will not make a Mercury.

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Maintenance to those who are sent by them to the University. This I confess is or should be no motive to them that need it not, but a very great one to them that do; nor doth it signify any thing to them that are not intended for the University, but to poor Lads who are so designed, it makes great Amends for all the hardships they commonly endure in Schools.

best Discipline. There Boys do stand in the greatest Awe. Some Boys will be Ranters in Private Schools but in Publick Schools they are as Demure as Quakers.

Seventhly and Lastly. Publick Schools do furnish Boys with due boldness and confidence, and are not afraid or ashamed to look a Man in the Face, no nor spit in his Face upon a good occasion. Now the Lord Bacque tells us, Considence can do Wonders: When Mahomet had promised to make a Mountain at a great distance to come to him at his call, and Multitudes

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waited to see the performance which he could not effect: He did but fay with a good laudable Confidence, if that Mountain will not come to Mahomet 'I tell you what, Mahomet will go that Mountain, and it passed for a Miracle among the common People. many Professions require a great deal of Confidence, Lawyer's must sometimes fet a good Face upon a bad Cause or it will be the worse for their Clients. Physicians must have a conve-'nient boldness to be out-braved by 'Mountebanks, out-talked by Mid-'wives, Nurses, Old Women and every Medling Gossip, but if any Man can answer these seven Reasons I ' shall content my self with a Private School.

An Oration in praise of Private Schools above Publick.

Gentlemen and Ladies.

'The foregoing Orator delivered his Judgment (if that were indeed his 'Judgment) in preference of Publick Schools. I profess my felf to be for Private Schools rather than Publick, and shall endeavour to shew you the weaknich

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the eakweakness of his Reasons (though they were possibly the best that his Cause would bear) and then give you mine for the contrary opinion. In the contrary

He told us that Publick Schools have the best and ablest Matters. Surely it ought to be fo, and many times is, but if the incomparable Farnaby, Brinfley, Hoole, &c. and some others such as they were Masters but of Private Schools, the most Publick Schools can have no better.

His next Argument was that Publick Schools do make the best Scholars, he ought to have faid, they make more good Scholars than Private Schools do, and well they may for they have more Scholars to make. But if a School confifting of but 20 Lads, shall every Year as sufficiently fit 2 for the University, it is as much in proportion as if a School of 200 should fit 20.

'That Lads are more excited by Emulation in Publick Schools than in Private was another of his Arguments. Tis true they may be so; but what is the Emulation he fpeaks of but Pride, Vain-glory and Ambition; whereas Fear and Love whereby Boys

'are managed in Private Schools are no Vices but meer natural Passions. More over this may be said, those Lads who out-strip others, by how much more Publick the School is, by so much more they are lifted up with Pride; and so much more discouraged and beaten out of heart, if others do much out-strip them, which answers his fourth

'Argument.

'Would you think that one of his Arguments should be that Publick Schools do make Boys Bold and Confident? To that I answer, if Boys be Meek and Shamefac'd, such School are apt to daunt them more, and those that are naturally Bold they mak quite Impudent. Thus weak are a the Reasons he hath given, on the behalf of Publick Schools, and east to be retorted upon himself. The few Reasons I shall present you with on the behalf of Private Schools are a follow.

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Where fewer or lesser Scholar are, it may be strongly presume there will be fewer and less Vice Amongst many Scholars there will be many Vices and the greatest Vice commonly amongst the Greatest Lagrangest Commonly amongst the Greatest Commonly amongst the Greatest Commonly Commonly

who to the Vanity of Children do often add the Viciousness of Men.

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'Infection, as to Life and Learning may be expected in a Private School than in a Publick. As Sick People must needs have better looking after in a Private House, where each have a Nurse to him or her self, than in a great Hospital, where one Nurse hath the charge of many Patients: And Guests are better entertained when but sew are Invited than at the Catholick Wedding of a Quaker that bids Thousands, or sets the Door open for all Comers.

Great and Publick Schools feem not fo fit for the smaller fort of Boys, who are not able to defend themselves from those abuses and injuries which a great number of Lads bigger than themselves will be ready to offer them upon all Occasions (when they are out of the School) sending them home many times by Weeping-Cross.

'Private Schools do best discover the Humours and Tempers of Children which the severity of Publick ones makes them to conce l. Children in Private Schools are like Beesin Glass-

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hives

'hives, where all their Works and Hu'mours may easily be discerned, and
'when an ill-humour or inclination is
'once well known, it is half-cured. I
'therefore observing that there are no
'real conveniences in a Publick School
'(of all that have been alledged) but
'what may be had in a Private, and
'many conveniences may be had in a
'Private School which cannot be en'joyed in a Publick, shall therefore con'clude for the former, as deserving in
'many respects preserve to the
'latter.

The Moderators Oration,

Gentlemen and Ladies.

Since it hath fallen to my share to be this day a Moderator, and a kind of a Judge betwixt those two Orators which have opposed each other, one pleading for Publick Schools above Private, the other for Private above Publick, it will become me to acquit my self as Impartially as I can, and you must judge whether I do or no.

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Publick Schools are certainly the best in some respects, and upon some accounts. First, their Masters are the best Masters, and do most good, because they have most to do good to. If they be not greater Lights than other 'Masters (as the Moon is not than o-'ther Stars) yet they are greater La-'minaries (as the Moon is.) If they have not greater Abilities, yet they 'have greater opportunities. If they 'are not better Soldiers, yet they are greater Officers and Commanders. 'Now there is an honour due to Perfons, not only for their internal worth 'and merits, but also for their external place and quality. Publick Schools are best for some fort of Boys, but not for all. First stout and sturdy Boys 'that cannot be governed elsewhere, 'as Marshal-Law is best for Soldiers, 'Little-ease for Servants that will not be subject to their Masters. I fancy that the Masters of some Publick 'Schools would tame the Great Mo-'gul or the Grand Seignior if he were their Scholar, and should contend with them; fo wickedly would they belabour him, for you know, Labor omnia vincit improbus. Secondly, For Boys

Boys that will greatly answer to the Spur of Emulation more than to any 'thing else; great Schools are best because there is the greatest Emulation, provided always that their metal and strength can hold that Gallop which it will put them upon, and they not break their Winds. ' fome! Boys there are that have no 'Emulation to excell others, either be-'cause they content themselves with this, that it is well known they could 'excell other if they would, or else because they think if they would excell others they cannot. Then as for Lads that are poor and want Exhibitions, they must take Publick Schools, as 'Men take their Wives for better for worse, for if they be worse to others, 'yet they are best to them. These ' are the advantages of a Publick School. But,

'Private Schools are better in other respects, and for another sort of Lads. If Boys be given to Vice, Private Schools are better for them than Publick, because in the latter of these, there are more to insect them, and more for them to insect; more to make them worse, and more to be made worse

worse by them. Moreover in a Private School, vicious Boys may be more easily detected, as it is easier to find a Thief in an open Forest than in a thick Wood. If Lads be young, tender, meek and foftly, Private Schools are best for them. Again, if Boys be dull and unapt to Learn, Publick 'Schools will but difgrace and difparage them. The less they can do there, the more they will fuffer. For of them that cannot make Scholars they will make Examples, and they that cannot themselves learn through incapacity are made to teach others to learn that will not through neglignce. Again if Parents desire that their Children should learn any thing out of the usual rode of Schools, as Musick, Dancing, Mathematicks, other Oriental Languages besides the Hebrew; Private Schools are best for that purpose, because Publick Schools will not go out of their Rode. Lastly, Private Schools do usually send their Scholars to the 'University before their Beards be grown, which Publick Schools many times do not. There Scholars many times do begin to suck their Mother the University, when it is high-time 'they were Weaned; and are but A-'cademick Children. These five last 'are the advantages of a Private 'School.

But upon the whole matter I think it just and fit to say that as healthy Constitutions can live and thrive much what a like in any tolerable Air, be it sharp or mild, open or close, Country or City, so the matter is not great whether the School a Child is put to be Publick or Private, provided the Master be good, and the Scholar ingenious and towardly.

But now fearing my Reader over wearied with these less curious Orations I would have him to divert himself with a more Banquetlike variety to be found in many Roman Histories, Caussin's Holy Court and others, where are many excellent Orations full of Elegant sweetness, of admirable Texture and Composition, these being but the easie products of an inferiour study, and the Offspring of Infant years.

Cornelius Agrippa in his Vanity of Arts and Sciences, faith it remains to this day a question undetermined whether Rheto-

Rhetorick bean Art or no. For Socrates in Plato by most found Reasons argues it to be neither an Art nor a Science, but a certain kind of Subtlety, and that neither Noble nor Honest, but meer low, illiberal and fervile Flattery, and as for Memory, right Pronunciation and Invention they are meerly Natural Effects which is indeed not a little evident in Antonius the Prince of the Latin Orators. And altho' before Thisias, Coraces and Gorgias there was not any one who had either taught or wrote of Rhetorick, yet were there many Men who through the strength of their Natural parts became very Eloquent. It hath been an Ancient opinion that the Precepts of Oratory are more hurtful than useful to the Life of Man. For this deluding Mystery is that from whence all Prevaricators, Jugling Shufflers, Back-biters, Sycophants and all other Lewd and Vile-tongued Persons derive their Malice and Knavery. With this Art many Persons endued raise Seditions and Commotions in Nations, while by their Nimble Tongues some are Deceived, some Flattered, some over-perfuaded usurping as it were a kind of Tyranny over Men not fo fubtle

fubtle as themselves, and Æschylus writes that Composed Orations are the greatest Evils in the World. Also Raphael Volaterraneus a most studious Lover of Histories and Examples, confesses that upon due consideration of all that he had read or feen either of Ancient or Modern Stories or Examples, he finds very few Eloquent Men to be good Men. Hath not (faith Agrippa) this thing, called Eloquence not only greatly disturbed most Potent Commonwealths but also wholly ruined them? Witness the Examples of Brutus, Cassius, Gracchus, Cato, Cicero, Demosthenes, who as they were accounted the most Eloquent, so were they the most Seditious and Turbulent of their time, For Censorious Cato being himself fourty times accused; seventy times accused others, being nothing but a continual diffurber of the Peace with his Mad Declamations all his Life long. The other Cato called Uticensis, by provoking Casar, was a great occasion of the utter Subversion of the Roman Liberty. In like manner did Cicero provoke Anthony to the great Mischief of the Empire; and Demosthenes Incensed Philip to the Ruin of the Athenians; to that there is no State or GovernGovernment, but has been highly injured by this Art. By Eloquence bad Causes are defended, the Guilty faved from the Punishment of the Law, and the Innocent Condemned. Marcus Cato the most prudent among the Romans forbad those three Athenian Orators Carneades, Critolaus and Diogenes to be admitted to publick Audience in the City being Men endued with fuch Acuteness of Wit and Eloquence of Speech that they could with great ease make Evil, Good, and Good, Evil. From this Art flow those Numberless Sects. Herefies and Superstitions that Contaminate Religion, and Men are fo affected with the Charms of Eloquence that rather than not be Cicerouians they will turn Pagans. See more in Agrippa p. 33. to 40.

Covernment, but has been highly inred by this Art. By Floquence bad nutes are de ended, the Suity faved on the Puni hment of the Law and the mocent Condemned. Maxwes Carothe most princent among the Renger Se ad those three Advaisa Antons Cara ...der, Critoleus and Discous to be ad. stred to publick Andience in the Car ang Men andred with tuch Acuire. uels of Wit and Eloquence of Speech east they could with great cafe make. t. J. Good, and Good, Lysl. From as Art flow those Numberleis Seds. terafics and Superfluions that Conuninate Religion, and with are lo ested with the Charms of Eloquence or rather than not be Carement 'y will min Pagame Sue more (11pps p. 33: 10 40.

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MUSICK.

TUfick, in Latine Musica, in Greek wesun, a wesa, i. Musa, i. Cantus, is here to be understood that part of Musick which relates to the Knowledge of Sounds, by which a true Concordance or Harmony is produced by means of the Voice or Hand, and not that part which teacheth the Laws and Rules of Poetry to which it is accounted a Sifter, and an Art Unsearchable. Divine and Excellent; A Mistress that moderateth the Affections of the Mind; The Soul of the World according to the Platonicks;) The President of the Spheres, and so highly esteemed (according to Plutarch) that the Ancient Philosophers placed Musical Instruments in the Hands of their Gods. Joseph Sila

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Silvester faith, in his Commentary upon Du Bartas, fhe is the Rapture of the Soul, the Mistress of Affections, Genius of good Wits and the Type of Felicity. And the Heathens did not without some sufficient Reasons Invent those Fables of Orpheus moving wild Beafts and Trees to Dance, and Amphion whose Musick drew Stones to the Building of the Walls of Thebes. Venerable Bede writeth that no Science but Musick may enter the Doors of the Church, and Holy David was feldom without an Instrument in his Hand; we also read in the first Book of Samuel Chap. 10. touching Saul, who meeting with a Company of Prophets with Mufical Instruments, Prophesied incontinently; and in the 2d. of Kings Chap. where Elizeus is spoken of, who cauled a Player upon Instruments to be brought to him, and as the Musician founded, the Spirit of God came upon the Prophet. The Ancient Britains had Musicians before they had Books, and the Romans that Invaded them, Confessed what Power the Druids and Bards had over the Peoples Affections, by recording in Songs the Deeds of Heroick Spirits; and many wonderful Relations

lations are to be found in the Books of Musicians and others, of the Charms

of this Science.

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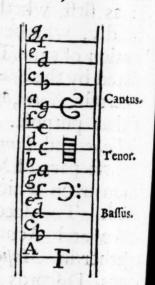
The Object of this Science is Sound, and that Sound is two ways confidered: as first whether Grave or Acute; fecondly, whether Long or Short, as to duration of time. The first of these is regulated by the Scale of Musick, the latter by certain Notes, Marks or Signs invented for that purpose. And these two (called Tune and Time) are the Subject of the first part of Musick, and the Foundation upon which the other parts are raised. The second part shews how Grave and Acute founds are joyned together in Musical Concordance. brings Discords into Harmony out of these two, viz. Concords and Difcords is formed another part, called Figurate Descant, which Figurate Defcant being brought into Canon is the Culmen of highest Degree of Musical Composition, according to the Proen in Mr. Symplon's Compendium of Pradical Musick.

The end and Office of the Scale of Munck called the Gamut, is to shew the Degrees by which a Voice Natural or Artificial may either Ascend or

K 2 Descend.

Descend. The Syllables used in Sing ingare Ut, Re, Mi, Fa, Sol, La. The common Scale to mark or distinguish the Degrees (which are seven) makes use of the seven Calendar Letters, viz. A.

B. C. D. E. F. G. after which follow A. B. C. &c. over again, fo often repeated as the Compass of Mufick requires. In Affcending they are reckoned forward, in Descending backward. Where note every Eighth Letter together with its Degree of Sound



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(whether you reckon upward or downward) is still the same as well in Nature as Denomination. Together with these Letters the Scale consists of Lines and Spaces, each Line and each Space being a several Degree, as you may perceive by the Letters standing in them. These Letters are called Cliss, Claves or Keyes, because they open the meaning of every Song. On the lowest Line is commonly placed this Greek Letter T which Guido Aretinus who reduced

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reduced the Greek Scale into this Form, did place at the bottom to fignifie from whence he did derive it; and from this Letter the Scale took the name of Gamma or Gam-ut. On the middle of the Scale are three Letters in different Characters; of which some one is set at the beginning of every Song. The lowest is the F . Cliff, which is peculiar to the Bass. The highest is a G Cliff, made thus, & and tignifies the Treble or highest part. Between these two stand the C Cliff #, which is a fifth below the G Cliff, and a fifth also above the F Cliff, as you will find by counting the Degrees of the Scale, reckoning both Terms inclusively. This Cliff standing in the middle serves for all Inner parts. When we fee any one of these, we know thereby what part it is, and also what Letters belong to each Line and Space, which tho' (for Brevity) not fet down at large, are notwithstanding supposed to be in those five Lines and Spaces, in such order and manner as they stand in the Scale it felf why solods or heron the

Us and Re being left out, and

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Example.



The whole Gamut or Scale on the Five



To fing the Notes you cannot use the words Gammet, Are, &c. they being too long, therefore there meaning was Contracted to these Syllables Sol, la, mi, fa, Ut and Re being left out, and are with less Confusion supplyed with Sol and La.

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Now althor there are but 22 Notes let down, Musick is not confined to that Number, for sometimes you will meet with Notes both below and above what is herefet down (according to the Will of the Composer) and then is added a Line or two more as the Song requires, those Lines so added being called Ledger-Lines, and observe that all fuch Notes in the Bass are called Doubles, as one Note below Gamur, Double Ffaut two Notes below Double Elami, and fo Descending to Double Gamut. Likewise all Notes above Ffaut in the upper Line of the Treble are called Inalt, as G solreut in alt. Alamire in alt, and fo on. fee also that all Notes are placed gradually, so that if you would write down 8 Notes in order ascending one above another, and the first Note to be Gfol reat in the Treble Cliff, which is upon the Line, the next in order must be Alamire in the Space, the next Bfabemi on the Line, and fo on till you come to G solreut in alt. By which you may observe that every 8th Note bears the same Denomination, as from Gamut to G solreut, from Are to Alamire, and to Alamire again, and thus might they ascend if stwere possible to a Thousand, it being K 4 only

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only the same overagain, and as it bears the same Name so it gives the same Sound, only shriller as it Ascends, but if 10000 Persons were to sound a Note just 8 Notes above one another, it would all sound like one Note.

Of Notes the large, the Long, and Breve were used formerly; but since Musick grew to more perfection, they have added other Notes not to long, for the Breve is twice the length of a Semibreve, a Long twice the length of a Breve, and a Large twice the length of a Long, and is a Sound of too much durance to be held by any Voice or Instrument, but an Organ.

The Characters and Names of the Notes.



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These are the several Marks to which they apply the Syllables Sol, la, mi, sa, and the Measure or Proportion of Time each Note requires is thus: A Semibreve (which is called the Master Note, it being the longest Note for quantity of Time now in use,) is performed while you with leisure tell, 1, 2, 3, 4. The Minim is but half the time of the Semibreve, the Crotches but half the length of the Minim, The Quaver half the Crotches, the Semiquaver half the Quaver, the Demissional Demissional Market Semiquaver or Demissional Market Semiquaver.

Time hath 2 Moods or Characters by which it is distinguished, viz. Common Time and Tripla Time, all other Variations and Distinctions of Time take their Original from these two, the Marks of which are always placed at the beginning of your Song or Lesson.

Common Time, is of three forts, the first and slowest marked thus C: is Measured by a Semibreve, and divided into four equal parts, telling 1, 2, 3. 4, distinctly putting your hand or foot down when you tell 1, and taking it up when you tell 3; and observe to

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have your hand or foot down at the beginning of every Bar. Every down and up is called a Time or Measure. The fecond fort of Common Time is a litthe faster, which is known by the Mood having a stroke through it #. fort of Common Time is quickest of all, and then the Mood is thus \$ you may tell 1, 2, 3, 4. in a Bar almost as fast as the Regular Motions of a Watch. The French Mark for this retorted Time is a large Higure of 2. There are two other forts of Time for the equal Division of the Bar with the hand or foot up and down. The first of which is called fix to four, each Bar containing fix Crotchets or fix Quavers, 3 to be fung with the hand down, and 3 up, and is marked thus a but ve ry brisk and always used in Jigs. The other fort is called twelve to eight, each Bar containing 12 Quavers, fix with the hand or foot down, land fix up, and marked . Before you rightly can keep time you must learn the length of your Notes perfectly.

Tripla Time thay be diffinguished into two forts. The first and slowest of which is measured by three Minims in each

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each Bar, or fuch a quantity of leffer Notes as amount to the Value of three Minims, or one pointed Semibreve telling 1. 2. with your hand down, and up with it at the third, fo that you are as long again with your hand or foot down as up. This fort of Time is marked thus 2. The fecond fort is faster, and the Minims become Crotchets, so that a Bar contains three Crotchets, or one pointed Minim; 'tis marked thus 3, or thus 31, or three to four, marked thus . Sometimes you'll meet with three Quavers in a Bar, which is marked as the Crotchets, only fung as fast again.

There is another fort of Time used in Instrumental Musick, called nine to six, marked thus 2, each Bar containing nine Quavers or Crotchets, six to be played with the soot down and three up. This Mr. Playford in his Introduction to the Skill of Musick reckons amongst Tripla Time, because there is

as many more down as up.

In the middle of some Songs or Tunes are found Quavers joyned together three by three, with a figure of three marked over every three Quavers, or perhaps only over the first three. Those

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are to be performed each three Quavers to the value of one Crotchet, which in Common Time is the fame with twelve to eight and in Tripla Time the fame with nine to fix. A Perfection in these Moods must be learned which cannot be without diligent Practice.

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For Tuning the Voice you must have affistance of some Tunable Voice or Instrument at first, and for tuning your Notes, take this Lesson of Plain Song upon 5 Lines in the Treble, or G sol re ut Cliff, consisting of eight Notes gradually Ascending and Descending, agreeing with the 8 uppermost Notes in the Gamut with the mark of Common Time placed in the beginning.



When a Sound is given to the first Note called Sol, you rise to La (the next in order above it) one whole Tone or Sound, and another whole Tone to Mi, from Mi to Fa is but a half Tone; from Fa to Sol, and Sol to La are whole Tones, from La to Fa but half a Tone; from Fa to Sol a whole Tone, and you might Ascend, if your Voice would permit

mit you Ten Thousand Octaves in the same Order as this one. The difference of whole Tones and half Tones in rising and falling are, whole Tones are Chearful to the Ear, and half Tones Melancholy. And there are always two half Tones either rising or falling within the Compass of eight Notes, and those two are called Fa; for to rise from Mi to Fa, and from La to Fa are Melancholy Sounds; also to fall from Fa to La, and from Fa to Mi are Melancholy Sounds.

When you have founded the first Note, you rise by whole and half Tones, (as before observed) till you Ascend to the top of your Lesson, and then down again, laying your hand down when you begin to sound the first Note, and taking it up when you have half sung it then laying it down at the next, and up again, so consequently of all the rest that are of the same quality according to the Directions before in Common Time.

To learn to fing in Tune at first, you must get the assistance of one either skilled in the Voice or Instrument, and let him Sing or Play the 8 Notes over with you, till you have fully learned

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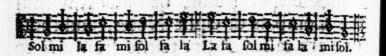
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ed them, which being perfect in, you proceed to a Lesson somewhat more difficult called Thirds, because of skipping from first to third and so missing a Note upon every Bar as you rise and fall.



This Lesson put in Minims are to be Measured one with the hand or foot down and one up. More Examples of Leaping and Skipping in General may be seen in Mr. Simpson's Compendium of Musick; and Mr. Playfords Introduction to the Skill of Musick, a Book very necessary, and very useful for all young Practitioners and othersthat intend to learn the Rudiments of this Science, which Book is Cheap and very valuable.

Rests or Pauses are a Character of Silence, or an Artificial Omission of the Voice or Sound proportioned to the measure of other Notes, according to their several distinctions; which that the Performer may not Rest or Pause too long or short before he Plays or Sings again, there is a Rest assigned to every

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every Note. As for Example the Semibreve Rest is expressed by a stroke drawn downwards from any one of the fiveLines half through the space between Line and Line. The Crotchet Rest is turned of like a Tenterhook to the Right hand and the Quaver rest to the Left. The Semiquaver Rest is with a double stroke to the left, and the Demisemiqua-ver Rest with a Triple stroke to the left. At any of these Rests, you cease Playing or Singing till you have counted them filently according to their Value in time before you Play again; as when you meet with a Semibreve Rest, you must be as long silent as you would be performing the Semibreve, before you Sing or Play again, and so of a Crotchet, a Quaver, &c. If the stroke be drawn from one Line to another then 'tis two Semibreves, if from one Line to a third then 'tis four Semibreves, as in this following

Exam.

Example:



Note when you meet with any Semibreve Rest made in Tripla Time, or in any other fort of Time besides plain Common Time, it serves for a whole Bar of that time which you Sing or Playin, altho' the Time may be longer or shorter than a Semibreve; or if it is drawn from Line to Line (like two Semibreve Rests) it serves for two Bars and no more or less; so for 4 or 8 Bars or more according as marked down.

The Prick of Perfection, or Point of Addition is a little point placed always on the right side of the Note, and adds to the Value of the Sound half as much as it was before; for as one Semibreve contains two Minims, when this point is added to the Semibreve, it must be held as long as three Minims; so of Crotchets, Quavers, &c. as in this

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Sometimes a Prick or Point is placed at the beginning of a Bar, which belongs to the last Note in the preceding Bar.

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As for Example.



The same Example by Notes.



Notes of Syncopation or Driving Notes are when your hand or foot is taken up or put down while the Note is founding, which is awkward to a young L Practi-

Practitioner but once doing it well, he is pretty perfect in keeping Time.

Tyed Notes are of two forts, 1. An Arch or stroke drawn over or under two or three or more Notes which signifies in Vocal Musick so many Notes to be Sung to one Syllable, in Musick made for Viols and Violins it signifies so many Notes to be played with one Motion of the Bow. The 2d. fort of Tyed Notes are with a strait stroke drawn thro' the Tails of stwo, three or more Notes: Examples whereof may be seen in almost all Tunes whatsoever.

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The Flat marked thus b, and the Sharp marked thus #: are to Flat and Sharp any Note they are placed before. For Example, if you were finging up your eight Notes and coming to Cfolfa or the first Fa above your Mi, you should find a sharp in that space, it must not be Sung as half a Note (as is directed before) but a whole Tone above, the quality of a Sharp being to raife any Note, and add a Semitone to make it more Acute and Sharp. When you descend to a Sharp, as from La to Sol and a Sharp should be in Sol then you fall but half a Note which is a Melancholy

tholly Sound as is faid before, and is like falling from Fa to La, or Fa to Mi A Flat when placed before any Note, which you should found a whole Note or Tone higher than the Note just before it, obliges you to found it but half fo high in the same manner, as from Mi to Fa or La to Fa. observe when these Flats and Sharps stand at the beginning of your five Lines, it makes all the Notes in that Line or Space to be sharp, that is half a Tone higher throughout the Lesson without changing their Name. In any other place they serve only for that particular to which either of them is applyed.

A Direct is usually put at the end of the Line and serves to direct to the place of the first Note on the next Line,

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Bars are single and double. Single Bars divide the Time according to the Measure of the Semibreve. Double Bars Divide the several Strains or Stran-

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za's of the Songs and Lessons. If they have Pricks on each side the Strains are to be repeated.



A Repeat thus made Σ , fignifies a Repetition from that place only where it is fet.

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A Key is a Song or Tune depending on a Sound given as suppose you have a Lesson or Song pricked down, obferve in what Space or Line the last Note of it stands on, and that is the Now it very often begins in the Key, but sometimes a third or fifth above it, and so it cannot be so well known but it certainly ends in it. There are but two Keys in Musick, one Flat and the other Sharp which is sufficient to write down any Melancholy or chearful Song They produce feveral whatever. Alterations of Keys or Tones by being placed at the beginning of the five Lines. The Melancholy or Flat Key without either Flat or Sharp at the beginning is Are or Alamire, the Sharp or Chearful Key without Flat or Sharpat the begining is Cfaut or Csolfa they are called the two two Natural Keys, because a Song may be fet in either of them without the . help of Flats or Sharps, which cannot be done in any other Key, but there must be either Flats or Sharps placed at the beginning. The Principal Keys made use of are Gamut Flat and Sharp, Are Natural and Sharp, Bmi Natural and Flat, Cfaut Natural and Flat, De fol re Natural and Sharp, Elami Natural and Flat, and iometimes Sharp, Ffaut Natural and Flat and sometimes There are more but not of much use. The Keys must always be named in reference to the Bass, which doth always conclude the Key. fureit way to understand the feveral Keys is first to get Lessons in the two Natural ones, till you are perfect in them, and then proceed to one Flat, and fo on to two or more till you have conquered all. The like method is to be observed in the Sharps. For more large Instructions and Examples of the Melancholy and Chearful Keys fee Mr. Playford's Introduction to the Skill of Musick. It being my design to treat only of the Rudiments of this Science.

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The Trill or Shake is the principal Grace in Musick and most used, the Directions for learning it, being only to move your Voice eafily upon one Syllable, the distance of a Note, First moving flow then faster by degrees, and fo will it come to you with little practice; but beware of hudling the Voice too fast, for B fabemi and Alamire ought both to be founded distinctly, your shake being compounded either of a whole or half Tone. The Trill ought to be used on all Descending Pricked Crotchets, also when the Note before is in the same Line or Space with it, and generally before a Close, either in the middle or the end of a Song. Some Notes that ought to be shaked have Crosses over them thus x, but Practice and good Obfervation will instruct you fully there-

To the Viol, Lute, Theorbo, &c. are Frets or Stops upon the Neck which are put for stopping the various Sounds according to the several Notes of the Gamut both Flat and Sharp, and Letters are set for the Frets as for Example of the Bass Viol, in the way of Tablature stand six Lines for the six strings of the Viol, the highest for the highest or Tre-

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ble string, as a for the open string, b for the first Fret, c for the second, &c. each Fret making the distance or interval of a Semitone or Half Note.

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E :	fo a	a	B	t	0	3	P	5	B	
S t	. 0 a	a	B	t	18	3	2	1	B_	
~ 2	Jea	a	B	t	10	3	12	7	B_	$\Pi \Box$
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For an Introduction to the playing on the Bass-Viol called the Viol de Gambo or the Confort Viol, the Musick whereof is played from the Rules of the Gamut, and not as the Lyra Viol which is by Letters or Tablature. Also on the Treble-Viol, Tenor-Viol and Bass-Viol which are but three feveral fizes of the Viol de Gambo, likewise on the Treble Violin, &c. you may have recourse to several Mufick Masters and their Books.

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An Interval in Musick is that Distance or Difference which is betwixt any two Sounds, where the one is more grave the other more Acute. In reference to Intervals ought first to be considered an Unison that is one or the same Sound, whether produced by one fingle Voice or divers

divers Voices founding in the fame Tone, which Unison as it is the first term to any Interval, so it may be confidered in Musick as Unite in Arithmetick, or a Point in Geometry not divi-Sounds more or less distant from any supposed Unison, make greater or leffer Intervals. fuch as are contained within the Common Scale of Musick, may be divided into fo many Particles or Sections only, as there be Semitones or half Notes contained in the Scale, viz. twelve in every Octave as may be obferved in the stops of FrettedInstruments, or in the Keys of a Common Harpie. cord or Organ. Their Names are as follow.

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12 Diapason 12 Octave or 8th 1 1 Semidiapason 11 Defective 8th 1 i Sept major 11 Greater 7th 10 Lesser 7th 10 Sept minor 9 Hexachordon ma o Greater 6th 8 Hexachordon mi 8 Lesser 6th 7 Diapente 7 Perfect 5th 6 Semidiapente 6 Imperfect 5th 6 Tritone 6 Greater 4th 5 Diatessaron 5 Perfect 4th 4 Ditone 4 Greater 3d 3 Semiditone. 3 Lesser 3d 2 Tone 2 Tone 1 Semitone Unifon.

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2 Greater 2d 1 Leffer 2d One Sound.

Note the Defective 8th and Greater 7th are the same Interval in the Scale of Musick, also the Defective 5th and Greater 4th. Also observe that the Particle Semi, in Semidiapason, Semidiapente, &c. doth not signify the half of such an Interval in Musick, but only imports a Deficiency as wanting a Semitone of Perfection. Out of these Semitones or half Notes arise all those Intervals, called Concords or Discords, which substitute and make Harmony in Musick

The Art of Descant or Composing Musick in parts.

In the Scale or Gamut are seven Notes G. A. B. C. D. E. F. for their Eighths are the same in Nature of Sound. Of these seven some are called Cords or Concords and other Discords.

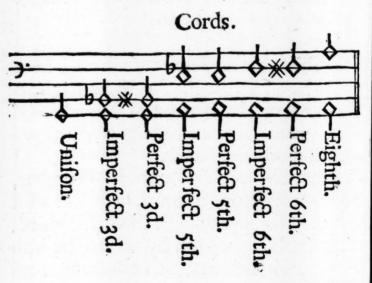
The Concords are four in Number, viz. An Unison, a third, a fifth and a fixth. (Sympson maketh them the third, fifth, sixth and eighth by which he also means their Octaves, as 10th, 12th, 13th

15th,

either Perfect or Imperfect. The Imperfect is less than the Perfect by halfa Note, as

A third Minor includes four half Notes. A third Major includes five half Notes. A fixth Minor includes nine half Notes. A fixth Major includes ten half Notes.

Perfects of the same kind, as two 5ths or two 8ths rising or falling together, are not allowed in Composition, but with either of the Perfect Cords you may begin or end a piece of Musick. The same with a third which is an Impersect, but it must not be with a sixth.



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Discords.



An Example of the Perfect and Imperfect Cords and Discords, with their Octaves.

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Examples how in composing of two or more parts the parts do either stand still, or the one doth stand still and the other move, or they both ascend

Perfect Cords.	Discords.	Imperfect Cords.	Difcords.	Perfect Cords.	Imperfect Cords.	Difcords.
1	2	3	4	5	6	7
8	9	17	18	12	20	21

they both ascend together, or descend together, or the one ascends and the other doth descend, with several Rules that direct how the Concords are to be taken or applyed, the use of Discords on Holding Notes, also Examples of taking Discord Discords elegantly and of Cadences and Bindings in three parts with many other Rules and Principles of Composition may be seen in Mr. Playford's Introduction to Musick and many others.

Also the Composition of three parts, four parts, and how a fifth and fixth may stand together in a Counterpoint. Composition of 5, 6, and 7, Parts. Of two Basses and Composition of 8 parts. How Difcords are admitted into Musick, Syncopation of two parts Passage of Discords, Discords Note against Note, Of Transition or breaking a Note, and Discords, in Double Transition with Relation Inharmonical, and three Scales of Musick, &c. may be feen in Mr. Sympson's Compendium of Musick, and the works of feveral Musicians Named in the Treatise of Musick in my Gentlemans Treasury. This being enough to invite you to further inquiry in those Books which treat wholly and only on that Excellent Science of Musick to perfect you in that Aart, to which I refer you for the General and Particular Rules of Composition, and here shall only tell

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How to make a Confort of Musick of many Parts with one Voice or Instrument only.

This Problem is resolved so that a Singer or Musician be near an Echo which Answereth his Voice or Instrument, and if the Echo answereth but once at a time he may make a Double, if twice then a Triple, if three times, then an Harmony of four parts: for it must be such a one that is able to exercife both Tune and Note as occasion requires. As when he begins ut before the Echo answer, he may begin sol, and pronounce it in the same Tune that the Echo answereth, by which means you have a fifth agreeable Confort of Mulick: then in the same time that the Echo followeth to found the fecond Note fol, he may found forth another fol higher or lower to make an eighth, the most perfect Consort of Musick, and so of others if he will continue his Voice with the Echo, and Sing alone with two parts. Now Experience sheweth this to be true, which often comes

believe there are many more parts in the Musick of a Quire, than truly there are because of the resounding and multiplying of the Voice, and redoubling of the Quire.

Agrippa in his Vanity of Arts and Sciences, faith, There never was any Mufician could pretend to know all the Consonances of Sound, or the true reafon of Proportions, and that there is no end of this Art, for that every day produces new discoveries therein, which in another Sence Anaxilas wittily hints, faying that Musick is like Libya which every year produceth some new fort of venomous Creature, and we read that Augustus and Nero were much condemned for giving their minds fo much to Musick, the latter of which pursuing it was for that cause more hated and derided, and none of the Poets ever made Jupiter to Sing or Play upon the Harp, but Pallas is politively faid to hate all manner of Piping. Nor did Ephorus fpare to condemn this Science as an Art Invented only to delude and deceive Men, according to Polybius, but the fame Polybius takes notice that the Com

Commonwealth of the Cynethenses in Arcadia falling from the delight they had in Musick, grew into Seditious Humours and Civil Wars, and Ithus from many occasions, are advantages taken by the Sciential Warriours to write Pro and Con upon all Subjects and Sciences.

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ARITHMETICK:

A in Greek apidustion, hoc est à numerando. The Art of Numbring consisteth of five common parts, Numeration, Addition, Substraction, Multiplication and Division, but because Numeration together with the Figures and places whereof it consisteth, are counted rather as first Elements, and principles of Arithmetick, therefore it is generally accounted no part of this Science.

Numeration is that part of Arithme, tick, whereby is known and expressed the value of any Figure according to his place. The Figures are, 1. 2. 3. 4. 5. 6. 7. 8. 9. and o. a Cypher which is no Number of it self, but only serveth to fill up a Number, and increase the value. As a Cypher standing with thus (10) maketh it signify Ten, to which,

which, if another Cypher were added, thus (100) it stands to make the Number signify one Hundred, as by the following Table will appear,

I	Unites.	1
12	Tens.	10
123	Hundreds.	100
1234	Thousands.	1000
	X Thousands.	
123456	C Thousands.	100000
1234567	Millions.	1000000
12345678	X Millions.	10000000
123456789	C Millions.	100000000

The first Figure or Place to the right hand is always the place of Unites, the second Tens, the third Hundreds, the fourth Thousands, &c. And if there be a Sum having many Figures or places, begin from the right hand, and count three Figures, then put this Mark (,) which there signifies Thousands, then counting three Places or Figures more, put the like mark above, and if there be more Figures, still at every distance of three, put the like mark, under and above still alternately changing, so shall you easily be able to count or express your Sum, as for Example.

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Hundred Fifty Four Thousand, Eight Hundred and Ninety Millions, Four Hundred Fifty Six Thousand, Three Hundred and Twenty one, the true value of this Number.

Addition.

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Addition teacheth to bring feveral Sums into one, which is done by placing every several Number, one right under another, under which you must draw a line, that done, you must add together the Numbers of the first Rank, beginning on the right l. hand with the lowest Figure of 2320 samerank, and so going upwards 1575 to the highest Figure of the same 1436 Rank, and so from Rank to 533I. Rank, till you come to the last. As for Example, I spent in one year 2320 Pounds, in another 1575 Pounds, in another 1436 Pounds; tetting these Sums down one under another. I add the first row of Figures laying 6 and 5 is 11, then fetting down I I carry I for the Ten to the next row, faying I which I bring and 3 is 4 and 7 is 11 and 2 is 13, wherefore I fet down 3 and carry one to the next row, faying r which I bring and 4 is 5 M 2 and

and 5 is 10 and 3 is 13, I fet down 3 and carry 1, faying 1 and 1 is 2, and 1 is 3, and 2 is 5: So have you the whole Sum. An Example of Sums, being in Columns of Pounds, Shillings, s. d. q. Pence and Farthings l. takethus. Having set 1675 10 08 3 'em down one under 983 16 10 1 another, I say 3 Far-58 19 05 4 things and 1 is 4 and 07 04 06 4 2 is 6, and 3 is 9 Far-2725 11 07 4 things which being 2

Pence Farthing, I fet down the Farthing and carry 2 to the place of Pence, taying 2 and 6 is 8 and 5 is 13 and 10 is 23 and 8 is 31 Pence, which makes 2 Shillings 7 Pence, therefore fet down 7 and carry 2 to the place of Shillings, faying 2 and 4 is 6, and 19 is 25, and 16 is 41, and 10 is 51 Shillings, which is 2 Pounds 11 Shillings, therefore set down 11, and carry 2, faying 2 and 7 is 9, and 8 is 17, and 3 is 20, and 5 is 25, fet down 5, and carry 2, faying 2 and 5 is 7, and 8 is 15, and 7 is 22, fet down 2 and carry 2, faying 2 and 9 is 11, and 6 is 17, fet down 7 and carry I faying I and I is 2, which fet down as you'see here done, and you have the whole.

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Substraction sheweth by taking a lesser Number out of a greater what remaineth; as for Example, I have lent one 987 18 11 4, and he 1. s. 987 18 11 \$ hath paid me 598 Pound 598 19 Shillings, and 7 388 Pence Halfpeny, fetting 19 4 down these two Sums, the greater above, and the leffer underneath, I begin and fay 2 Farthings from 3 and there remains 1, which I fet down, then I say 7 from 11 and there remains 4, which I fet down, then 19 from 18. I cannot have, wherefore I borrow I from the Pounds which is 20 Shillings, and fay 19 from 38 and there remains 19 which I fet down, then fay a which I borrowed and 8 is 9, 9 from 7 I cannot take therefore borrow I (which now is but 10) and fay 9 from 17 and there remains 8 which I fet down, then fay which I borrowed and 9 is 10, which from 8 I cannot take, but (borrowing i) from 18 there remains 8 which I also set downand then going to the last row, I say one which I borrowed and 5 is 6, from 9 there remain 3, which if they lagree M_3 with with the first Sum your Substraction is right.

Multiplication.

Multiplication is instead of many Additions, by which any Number of a greater Denomination is brought into a less as Pounds into Shillings, Shillings into Pence, &c. which is done by multiplying the Number of Pounds by 20, the Number of Shillings by 12, &c. and Multiplication confifts of three Numbers. 1. The Multiplicand or Number to be Multiplyed. Multiplyer or Number by which we Multiply. 3. The Product or Number made by the Multiplication. For the true order of Multiplying, and the more readiness therein, it is necessary this Table be committed to memory.

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1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5			20	-	-			-
6	1.2	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	24	32	40	48	56	64	72
9	18	27	36	45	54	63	72	81

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In 1256 Pounds it is required to know how many Shillings. I fet them down as you fee, and because the Figure of the Multiplyer is a Cypher, I set a Cypher under 20 the first Figure and go to the 25120 next, faying 2 times 6 is 12, fet down 2 and carry 1, then 2 times 5 is 10, and one which I bring is 11, therefore I fet down 1 and carry 1, then 2 times 2 is 4 and 1 which I carried is 5, fo I fet down 5, then I say 2 times 1 is 2, and therefore fet down 2 last of all, and thus the Multiplication is finished, for 25120 Shillings makes

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ration is by Division, for if you divide the Number produced by the Multiplication of the Multiplyer, you will find the like Number with the Multiplicand.

Division.

Division is that whereby any Number is divided into as many parts as you will, ferving instead of many Substractions; by which any Number of a less Denomination is brought into a greater Denomination, as Farthings into Pence, Pence into Shillings, Shillings into Pounds, &c. by dividing the Farthings by 4, the Pence by 12, the Shillingsby 20. Division consists of three parts, 1. The Dividend or Number divided. 2. The Divisor or Number dividing. The Quotient or Number fought for. 8928 Ells In Divisor. Dividend, Quotient Fnglish of Holland 36) 8928 (248 Cloth, how many pieces of Isingham Hol-172 land, each piece con-144 taining 36 Ells Eng-288 lish. Setting down 288 the Figures as you fee

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gure of the Divisor I can have in 8 the first Figure of the Dividend, the Anfwer is 2 times, then I fet down 2 in the Quotient, multiplying the Divisor by the same, saying 2 times 6 is 12, fetting down 2 under the 9 and carrying 1, then 2 times 3 is 6 and 1 which I carried is 7, which I fet under 8, then I substract 1 from the other, so there remains 17, which set under the Line, then draw down the next Figure of your Dividend which is 2, and place it to the right hand of your Remainder, setting a Prick under the Figure 2 to fignify it is already drawn down. Then I ask how many times 3 in 17, anfwer 5, which is 15 from 17 there remains 2, but 5 times 6 being 30 will not go in 22, therefore it must go but 4 times, ferting 4 in the Quotient I multiply the Divisor by it, and the Product is 144 which I fet under 172 drawing a Line, and substract one from the other, and there will remain 28 which fet under the Line, then draw down 8 the next Figure and last of the Dividend, fetting a Prick under that in your Dividend, and set 8 to the right hand of your last remainder 28, then say again how many times 3 in 28, Answer 9

times, but fince it cannot go in the next Figure I therefore take but 8 times, and therefore I fet down 8 in the Quotient, and multiplying the Divisor by 8, the Product is 288, which I fet down underneath, and substract one from the other, and there remaining nothing I find 248 is the Quotient and the number of pieces contained in 8928 Ells English of Holland Cloth. Another Example.

Suppose you were to divide 34|3 by

10, you cut off the first Figure

towards your right hand which

is 3 being the Remainder, and

so many parts of 10, and 346 is your Quotient, for you must understand 1 by it felf can neither divide nor multiply. Note, if you are to divide by 20 as in reducing Shillings into Pounds, need do no more but cut off the last Figure, and half the Remainder shall be your Quotient, and if the last Figure of what remains after you have cut off the faid Figure be an odd Figure, there will remain more than your Quotient 10 Shillings, besides the Figure cut off which will be so many Shillings more.

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Admit it were required to reduce 7355 Shillings into Pounds; cut off the Figure next to your right hand which is 5, then there will re-735(5 main 735, then take the half 367 thereof, faying the half of 7 is 3 and there remains 1, the half of 13 is 6, and there remains 1, and the half of 15 is 7 and there remains 1, which is 10 Shillings, which with the 5 Shillings was cut off makes 15 Shillings, fo 367 Pound is the Quotient and 15 Shillings remaining.

Progression Arithmetical

Is a brief way of adding together divers Numbers, every one furmounting the other by equal difference, as 1.2.3.4.5. where every one exceeds the former Figure by one. And for the ready performance thereof you are to work thus, first set down the Figures as 2.5.8.11.14. then count the Number of their places, which are 5, then set down 5 in a place apart, and then add the first Number and the last together, which here makes 16, take the half thereof, viz. 8. which multiply by 5 and the Product is the full Sum of all those Figures;

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gures; And if the first Number and last added together make an oddSum, and the Number of the Places be even, then you may multiply the Addition by half the Number of Places which produce the same as the other way, and thus your Progression is finished.

Progression Geometrical

Differeth from the other, the Excess of that being only in Quantity but in this of Progression Geometrical the Excess is in Proportion as when the 2d. Number containeth the first in any Pro-

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portion, as 2, 3, or 4 times.

A Merchant hath fold 15 Yards of Sattin, the first for 1 Shilling, the second for 2 s. the third 4 s. &c. Now to know how much the Merchant was to have for his Sattin, set down all the Terms or Numbers to the 8th Term, then multiply the last Number (which is 128) by it self, and thereof cometh 16384 for the 15th Term, which multiplying by 2, because the Progression is double, and thereof will come 32768 from which substract the first Term 1 there remains 32767 Shillings the Sum of the 15 Terms which

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which is 1638 l. 7 s. o d. and so much the 15 yards of Sattin cost.

Reduction

Teacheth how to reduce a Sum or Number of a greater Denomination into a less, or on the contrary a Number of a lesser Denomination into a greater, as to turn Pounds into Shillings, Shillings into Pence, and Pence into Farthings, as you may learn before in Multiplication and Division, and hereafter in working the Rules of Proportion.

The Rule of Proportion.

The Rule of Three so called, because by 3 Numbers known, we are to find the sourth which is unknown, is likewise for its Excellency called the Golden Rule, and by some the Rule of Proportion, for that the sourth Number is sound out by the Proportion it hath to other Numbers. For what Proportion the first number hath to Sthe econd, the same will the Third have to the sourth, as,

If
$$\begin{cases} \frac{1}{2} \\ \frac{2}{3} \end{cases}$$
 coft $\begin{cases} \frac{2}{3}, \\ \frac{4}{3}, \\ \frac{5}{3}, \\ \frac{1}{3} \end{cases}$ then $\begin{cases} \frac{2}{8} \\ \frac{1}{8} \end{cases}$ will coft $\begin{cases} \frac{4}{3}, \\ \frac{1}{6}, \\ \frac{1}{27}, \\ \frac{1}{3}, \\ \frac{1}{3},$

Here you see the first Number is contained in the second as often as the third is contained in the fourth. First by Reduction bring your first and third Number into one Denomination, and if your second Number have any odd Money or Number, reduce them into the least Denomination, then multiply your second and third Number together, the Product divide by your first and the Quotient will be your desire or Number sought, and must always be of the same Denomination with the second Number. To prove the truth of your Operation state your Question backward.

If
$$\begin{cases} 4 \\ 16 \end{cases}$$
 cost $\begin{cases} 2s \\ 8s \end{cases}$ then $\begin{cases} 2 \\ 4 \end{cases}$ will cost $\begin{cases} 2s \\ 2s \end{cases}$

Working thus backwards you will find the fourth agreeable unto your first Numbers, and therefore you may conclude your work is right.

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The back Rule of Proportion.

The back Rule of Three is so called because it produceth a Proportion quite backward or reverse to the Rule of three direct. For here in this Rule so much greater your third Number is so much less will be your fourth; as,

If 15 Shillings worth of Wine will ferve for the Ordinary of 69 Men, when the Tun is worth 12 Pounds, for how many Men will the fame 15 Shillings worth of Wine be sufficient when the Tun is worth 18 Pounds.

If 12 1. fuffice 69 Men. How many 18 1.
Answer 46 Men.

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Here you multiply your first Number by your second, or 2 Number by your 1, viz. 69 by 12, and the Product will be 828, which you must divide by your third Number, viz. 18, and the Quotient will be 46 the Number of Men required.

The Rule of Proportion Composed.

The Rule of Three Composed is so called because it is a Composing of two Questions or Operations of the Common Rule of three into one. Which two Questions may require a Direct Proportion or a Reverse Proportion, or one part may be Direct and the other Reverse, and so require a different 0-peration.

There belongs to this Rule always five Numbers, the first three contain a supposition, the two last a Question to which the Number found or sixth

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Number must be the Answer.

First part in the Rule Direct.

The five Terms or Numbers given, must be so placed that the first and fourth may be of one Denomination, the second and fifth of another, but like to one another, and the Answer in the sixth, the same with the third. And then multiply your first Number by your second and the Product shall be your Divisor, then multiply the other three Numbers together, and the Pro-

Product shall be your Dividend. And then Divide and the Quotient is the Number; as,

If 100Crowns in 12 Months gain 15 Pound what 60 Crowns in 8 Months? Answer 6 Pounds:

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The second part of the Rule.

The third Number is like unto the fifth and the Operation is thus. Multiply your third Number by your fourth, and the Product shall be your Divisor; then Multiply your first Number by your second, and the Product by your fifth, and the Product shall be your Dividend, then Divide and the Quotient is your desire; as,

If 60 Crowns, 8 Months gain 6 Pounds; in how many Months will 100 gain 15 Pounds? Answer 12 Months.

Multiply your third Number 6 by the fourth 100, and the Product is 600 for your Divisor, then Multiply the other 3 Numbers together, and the Product 7200 is your Dividend, then divide and the Quotient will be 12, the Number of Months required.

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The third part of the Rule.

In this third part of the Rule may be five Numbers or more, and the first and lat Number are always different.

The Operation whereof is thus.

The Question being from the last Number to the first, multiply the Number you would know by the Numbers which you give the value by the Multiplication of the Numbers already valued, and the Quotient is the Number required; as for Example,

If 4 Deniers Paris be worth 5 Deniers Tournois, and 10 Deniers Tournois be worth 12 Leniers Savoy; how many Deniers Paris are 8 Deniers Savoy worth?

Multiply 8 Deniers Savoy, being the Number you would know, by 4 Deniers Paris, and the Product by 10 Deniers Tournois, those being the Numbers which give the value, the Product is 320. Then Multiply the five Deniers Tournois by 12 Deniers Savoy, being the Numbers already valued, the Product is 60. Then Divide 320 by 60, the Quotient is 5 and ½ Paris, and so much are 8 Deniers

Deniers Savoy worth. And they will stand thus.

Paris. Tournois. Tournois. Savoy. Savoy. Paris
4 5 10 12 8 5

The fourth part of the Rule.

Here the first and last Numbers are always of one Denomination. And the Operation is thus. The Question is from the last Number to the last saving one.

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Multiply the Number you would know, by the Multiplication of the Number already valued, and the Product of the Multiplication of the Numbers which give the value; and the Quotient is the Number required; as,

If Paris. Tournois. Tournois. Savoy. Paris. Savoy. 4 d. 5 d. 10 d. 12 d. 15 d.22 d. 1

Multiply 15 den. Taris by 5 Tournois; and the Product by 12 Savoy, being the Numbers already valued, and they make 900, which divide by 40, the Product of the Multiplication of the Numbers; which give the value, and the Quotient will be 22 d. 5, the Number required.

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Numeration of Fractions.

In Fractions are always two Numbers which are always placed with a Line drawn between them thus \frac{1}{2} \frac{1}{4}, \colon \colon \colon
\text{whereof that above is called the Numerator, and that Figure or Figures underneath is called the Denominator.

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And Fractions or broken Numbers are either Properly fo called, or Improperly fo called. They are properly fo called when there are one or many parts of a Number, which yet do not amount to a whole Number, but are only Progreding or Augmenting parts, as 12 14 15 Ge. which do proceed Infinitely, yet never amount to a whole Number. Or else are progreding or diminishing parts, as \frac{1}{2} \frac{1}{4} \frac{1}{6} \frac{1}{7} \frac{1}{8} \frac{1}{2}, &c. which do likewise proceed infinitely, yet never amount to a o, or come to fignify nothing. Fractions Improperly fo called, are those which have the Denominator lesser than the Numerator, as 4, 6c. where the Numerator being greater than the Denominator, you may substract the Denominator from the Numerator, which you may do taking once 4 out of 6 and there remains 2, which remaining

ing 2 is 2, so that the improper Fraction being reduced, is properly one whole Number, and 2, that is two fourth parts of the whole Number. And all Fractions are expressed after this manner, 1 one half, 2 two thirds or two third parts of a whole Number, 2 three fourths, 4 four fifths, &c. which you may extend infinitely as Practice and Experience will inform you.

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Reduction of Fractions.

Forasmuch as we may not work the other Rules of Arithmetick in Fractions without the help of Reduction, we therefore place Reduction before 'em, whose usefulness will appear in the Operation, which is in manner following.

1 Rule.

Reduction of Fractions of Several Denominations, into one common Denomination.

Multiply the Denominators one by the other, and the Product is your common Denominator which common Denominator you must divide by the particular and Multiply every Quotient by his own Numerator, and the Product is your new Numerator, for every of those Fractions you would reduce. As for

Example.

If you will reduce 2 and 3 together, Multiply your Denominators, faying 3 times 5 is 15 for your common Denominator, then divide 15 by 3, the Quotient is 5, which Multiply by 2 your first Numerator and the Product is 10, which I place over 15, and so I find 33 equal to 3. Then I divide 15 by 5 the Quotient will be 3, which I Multiply by 4 its Numerator, and the Product is 12, which I set over 15, and so find 13 equal to 4. And this may suffice for the first Rule in Reduction.

2 Rule.

Reduction of Fractions or Eroken Numbers. Of Broken, is thus:

Multiply all the Numerators together to make thereof one Numerator, then Multiply the Denominators together for your Denominator; as, If you would reduce? of 4 of 4 into one Fracti-

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on, Multiply your Numerators, they make 8. Then Multiply your Denominators and the Product is 60, thus you find & equal in val e to ? of i of . And if you will reduce feveral parts of Fractions together, as if you will reduce of i of i, and i of s, and the i of the of 2 of 3. First you must of every part make one Broken Number, by this fecend Rule of Reduction as before. And afterwards you must by the first Rule of Reduction, reduce them all into one Denomination. As your first part which is ? of ! of ! being reduced will be as above. Your fecond part being; of; will be 15. And your third part which is the 2 of the 2 of 3 of 5 being reduced will be 2, which by the first Rule you must reduce into one Denomination, and fo will find sies for the and 32400 for the 15, and alice for the: 2, which may be Abbreviated, but we deferr that till we come to the Rule of Abbreviation.

N 4 3 Rule.

3 Rule.

Reduction of Broken Numbers, and the parts of Broken together.

If you would reduce the ! and ! of together, you multiply the two Denominators together, which here maketh 6, and set that down for the Denominator. Then Multiply the first Numerator by the last Denominator, which here makes 2, then add the last Numerator to it, which here makes 3. thus you will find that ; is in one Fraction equal to ? and the r of r. Likewife if you will reduce ? and ! of !, you must work as before and you will find ri, which are worth, or are of the fame value with 2 and 1 of 1. And being Abbreviated make or is the same with; as by the Rule of Abbreviation will appear,

4 Rule.

Reduction of whole Numbers and Broken, into Broken Numbers, which may be called Improper Fractions.

If you would reduce 17; into one Improper Fraction, you Multiply the whole Number 17 by the Denominator 8, which will make 136, and thereto add your Numerator 5, and it will be 141, which you must set down for your new Numerator over the Line, then set your old Denominator under the Line, and thus have you 141 in an Improper Fraction equal unto the whole Number and broken 175.

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Again if you would reduce a whole Number and broken with a broken Number, as to reduce 10² and ⁴ together, you must reduce the whole 10 into its broken ² as by the last Rule above, which will be ³². Then Reduce ³² and ⁴ into one Denomination by the first Rule of Reduction, and you have ³² for the ³² and ⁴ for the ³² and ⁴ for the ⁴, as appeareth by the Operation and Practice.

And

And thirdly if you have as well whole Numbers as broken in both parts, then you must reduce every whole Number into its broken as above by this fourth Rule of Reduction is directed. then reduce them into one common Denomination by the first Rule in Reduction, and you shall find Improper Fractions equal to your whole Numbers and Fractions, as if you would reduce 12! and 14° into one Denomination. reduce 12 all into fourths, and you shall find 49, then reduce 14? all into thirds and you shall find 44 then reduce 42 and 44 together by the first Rule in Reduction and you will find them to be 347 and 176 as by the Operation appears.

Proof of Reduction.

If you Abbreviate the Broken Numbers which be reduced, you shall return them into their first Estate, as if you reduce 2 with 4, you shall find 1, and 1, then Abbreviate 1, you will find 2, Abbreviate also 1, and thereof cometh 4 as before.

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Abbreviation of Fractions.

Abbreviation is by expressing or ferring down a Fraction of many Figures in a lesser Number of Figures without diminishing the value, and the Operation is thus. Divide the Numerator and the Denominator by the greatest whole Number you can, and the Quotient of your Numerator Thall be your Numerator, and the Quotient of the Denominator shall be the Denominator; as if you would Divide or Abbreviate ; you shall find 27 the greatest Number you may divide by, which you may have twice in the Numerator 54, therefore I fet down for the Numerator, and I may have 27 three times in 81. and therefore I fet down - for the Denominator, and thus is ! Abbreviated to ? which is of equal value.

Now to find out the greatest Number you may divide by, your Rule is first to divide the Denominator by your Numerator, and if any thing remain, divide your former Divisor by that Number, and so continue to divide your Divisor by your Remainder till

nothing

nothing remain, then your last Divisor is the greatest Number by which you must Abbreviate; that is thus, in the first Example of [4] Divide 81 by 54, there will remain 27, then divide 54 by 27 and there remains 0, wherefore 27 is the Number by which you must Abbreviate.

And there is likewife another way of Abbreviating, which is by taking half of the Numerator and likewise of the Denominator as often as you can; Or otherwise by dividing the Numerator and likewise the Denominator by 3. 4. 5. 6. 7. 8. 9. or 10. as you find you may. And if your first Figure or Figures bea Cypher, you may Abbreviate by 10 by cutting off the Cyphers and leaving the rest for the Fraction, as is which makes it 3, or by 100, as 100 which makes 1, and altho' all Numbers may not be Abbreviated by this Rule, yet all Fractions or broken Numbers may by the first Rule be well Abbreviated.

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Proof of Abbreviation.

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If you Multiply the Number Abbreviated by the Number or Numbers you did Abbreviate by, you shall return them again into their first Estate, as if you Abbreviate 12 by 16, you will find it 2, then Multiply the Numerator and the Denominator by 16, and you will find 12 as before.

Addition of Fractions.

I Rule.

The Rule for Addition of Fractions is if the Denominators be unlike, to reduce them into one common Denomination. Then add the Numerators together and set down the Sum of the Addition for the Numerator, and if the Numerator be greater than the Denominator, then divide the Numerator by the Denominator, and the Quotient is the value of the Addition in whole Numbers, and if any remain that is to be placed as a Fraction with the Common Denominator, as if you would add and together, you must reduce into

into one Common Denominator by the first Rule of Reduction, and they will be found to be 1/2 and 1/2. Then add the two Numerators together, and they will make 1/2 which is your Numerator, and 1/2 being your Denominator it will be 1/2. Now the Numerator being greater than the Denominator you must divide it by the Denominator, and you will find 1 for your Quotient and 5 remaining, which you must place as a Fraction with the common Denominator, and then you will find 1 and 1/2 to be the Sum of the Addition.

2 Rule.

Addition of many broken Numbers together.

And if you would reduce many broken Numbers together, first reduce and add the two first together, and then the two latter as by the Rule last above then add those two Fractions which come thereof together as by the same Rule, and you have the Sum of the Addition, as if you would add \(\frac{1}{2}\) \(\frac{1}{4}\) and \(\frac{1}{2}\) together. First add the \(\frac{1}{2}\) and \(\frac{3}{4}\) together.

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ther, and you shall find them to be 3, then add the 1 and 4 and they will make 1. then add 2 and 1. together by the same last Itule, and you will find them to be 120, and which then divide 326 by 120, and thereof cometh 2 and 86 remaineth, which is 15, and being Abbreviated is 13, and thus 212 is the Sum Total of that Addition as by the Operation will appear.

3 Rule.

Addition of Fractions of Fractions or Broken Numbers.

Reduce the first Numbers according to the second Rule of Reduction, Multiplying the first Numerators for to produce a Numerator, and the Deno-

minators of the fante for the Denominators, then do the like by the latter Numbers. Then Abbreviate the faid Fractions, or which of them will be Ab-

breviated, and then add them together

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	4	4 3	4 7 8	4 7 8 4	



as by the first Rule of Addition. As to add? of ? of * with the ? of the ? of the ? of the first ? Fractions for the Numerator, then Multiply the Denominator of those ? Fractions for the Denominator, and you will find them to be ??, which Abbreviated is ?. Then do the like by the other ? Fractions, and you will find them to be ??, which cannot be Abbreviated then add the ? to ?? by the first Rule of Addition, and you will find the whole to be ?? which cannot be Abbreviated, and therefore the Addition is ended as thay appear.

4 Rule.

Addition of Broken Numbers and Parts of Broken, with Broken and Parts of Broken.

As if you would add and and and of with the and of are duce the and into one Fraction by the third Rule of Reduction and thereof comeths, then re-





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duce the ? and ; by the same 100 202 102 41 Rule, and thereof cometh 16. Lastly add 2 and 16 together by the first

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of of Rule of Addition, and you will find the Sum to be 1935, which being divided make the one whole Number, and 1200, which being Abbreviated makes \$100, as by practice appears, and is 1852.

5 Rule:

Addition of whole Number and Broken; with whole Number and Broken.

If you will add 12½ with 24 25 384 625 20%, you may 4 25 64 12½ add 12 and 20 30 30 30 30 30 30 Which make 32 and fet them apart. Then the Broken Numbers ‡ and & by the first Rule of Addition and they make ½, therefore di-

vide 49 by 30 and it makes 1 and 19 remaining, which 13 and in the Sum of Addition is 335, or otherwise may reduce 125 into an Improper Fraction by

· V. 1.4

by the fourth Rule of Reduction and they will be *\frac{1}{2}, then reduce 20\cdot and they will be *\frac{1}{2}\cdot, then add *\frac{1}{2}\cdot with *\frac{1}{2}\cdot \cdot \cdot

Substraction of Fractions.

I Rule.

If you will substract \(\frac{3}{3}\) from \(\frac{1}{3}\) reduce both into a g common Denomination by the first Reduction and you will find \(\frac{3}{2}\), for that and \(\frac{1}{2}\) for the \(\frac{1}{3}\), then substract the 8 from 9, there will rest 1 which is the Remainder of that Substraction as here appeareth.

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2 Rule:

If you have a Broken Number to be Substracted from a whole, borrow an Unite from the whole Number, and Reduce 20 25

it into a Fraction of 8 ike Denomination 1 with the Fraction you $\frac{1}{7^{\frac{1}{3}}}$

would abate, and then bate the Fraction

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herefrom, and you will find the Remainder. As to abate \$ from 8, or to ubstract \$ from 8, borrow 1 from 8 and resolve it into fifths, making thereof, then abate \$ from \$, there will remain \$ as appeareth.

Or otherwise you may put down that and reduce them

nto a common Denomiation, and you will find hem to be \$ and 45, then ubstract \$ from 45, there

vill remain 15. As by ne Operation appears.

36 4 5 8 1

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3 Rule:

3 Rule.

If you would Substract broken Number
from whole Number
and broken, you must
work thus, as to substract & from 6& you
may let the 6 alone because you may substract & from &, and
therefore substracting & from 6 &, then
will remain 6 &, as by the practice wil
appear.

4 Rule.

To substract whole Number and Bro ken from whole Number and Broken If you would reduce and substract who Number and Broken from whole Number and Broken. As to substract 37 9‡ from 20\$ reduce 9\$ into fourths, which will make 31 then 20 into halfs they will make 42, then reduce then into one common Denomination, and substract one Numerator from the other the Remainder will be 22 as appeared

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the Quotient will be 11 and 2 remaineth, which is $\frac{2}{3}$ or $\frac{1}{4}$; and thus you find the Remainder to be 11 $\frac{1}{4}$, as by the Example appears.

5 Rule.

To substract Broken Numbers of Broken from Fractions of Fractions. If you would substract of of from the of of fraction one fraction, and likewise the Numbers of the latter part by the second Rule

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of Reduction, and you will have so for the first three Broken Numbers, and they being Abbreviated do make so, and for the other three Numbers so which likewise Abbreviated do make so, then reduce them into a Common Denomination, and tubitract them by the first Rule of Substraction and you will find so remaining; as by the Example appears.

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Proof of Substraction.

Add the Number which remaineth with the Number you did substract, and you will find the Total Sum, as if you substract ‡ from ‡ there will remain ½; the Proof is thus, add ½ and ‡ together, you will find ‡ which being Abbreviated doth make ‡ which is the greatest Number.

Multiplication of Fractions.

I Rule.

To Multip'y Two Broken Numbers.

Multiply the Numerator of the one by the Numerator of the other, and the Denominator of the one by the Denominator of the other, and then divide the Product of the Numerator if it may be; or else Abbreviate them if it may be Abbreviated and your Multiplication is done. As if you would multiply \$\frac{1}{2}\$ by \$\frac{2}{2}\$ fetting them down, Multiply the two Numerators, saying 2 times 3 is 6 which you must fer above, then Multiply the Denominators together and they will make

make 12 which set down underneath. Nowbecause the Numerator is less than the Denominator you cannot divide it, and therefore you must only Abbreviate it, and you will find it to be a shere you see.

$$\frac{6}{\frac{1}{3}} \frac{1}{12} \frac{2}{2}$$

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2 Rule.

To Multiply a Broken Number by a whole Number, or a whole Number by a Broken.

Reduce or make your whole Number into a Broken, as to multiply \$\frac{1}{2}\$ by \$\frac{1}{2}\$, or else 18 by \$\frac{1}{2}\$, set down \$\frac{1}{2}\$ and then multiply your Numerators together, and your Denominators together and you will find \$\frac{1}{2}\$, then divide \$72\$ by \$5\$, and you will find \$14\frac{1}{2}\$ in the Quotient for the whole of your Multiplication, or otherwise abate from \$18\frac{1}{2}\$ part which is \$3\frac{1}{2}\$ and there remained \$14\frac{1}{2}\$ as before.

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To Multiply a whole Number by whole Number and Broken, or whole Number and Broken by a whole Number.

As to Multiply 15 by 164, or 164 by 15, first reduce your 164 and that will make 44, which you must Multiply by 15 by the Rule above, and you will find the Product to be 2514 as by practice will appear.

To Multiply a Broken Number by whole Number and Broken, or elfe whole Number and Broken by a Broken Number.

As if you would Multiply \$\frac{1}{4}\$ by \$18\frac{3}{7}\$, or else \$18\frac{3}{7}\$ by \$\frac{1}{4}\$, reduce the whole Number into its Broken, and you will find \$\frac{16}{3}\$, which you are to Multiply by \$\frac{1}{4}\$ according to the Doctrine of the first Multiplication and it amounteth to \$\frac{1}{2}\$, then divide \$56\$ by \$12\$, the Quotient is \$4\frac{3}{4}\$ which is the Sum of that Multiplication, as by Example appears.

$$\frac{56}{\frac{16}{3}} \frac{18}{12} \frac{1}{12} \frac{18}{12} \left(4\frac{1}{3}\right)$$

5 Rule.

To Multiply whole Number and Broken with whole Number and Broken.

As if you would Multiply 123 by 62 reduce each whole Number into its Fraction, and you will find them 27 and

and ²4, then multiply them by the Doctrine of the first Multiplication and they will produce ^{1,2}28, then divide 1728 by 20, thereof cometh 863 for the whole Multiplication, as by Example.

6 Rule.

To Multiply one Broken by many Broken Numbers.

As to Multiply \$\frac{1}{2}\$ by \$\frac{2}{2}\$ and by \$\frac{1}{2}\$, Multiply all the \(\) umerators together for the merator, and all the Denominators for the Denominator, and you will find them to be \$\frac{1}{2}\$, which is the Sum of this Multiplication. And this is your Rule for all others of the like nature.

$$\frac{\frac{40}{2}}{189} = \frac{40}{189}$$

Proof

Proof of Multiplication of Practions.

Divide the Product of the Multiplication by the Multiplyer you shall find in your Quotient the Multiplicand. Or divide the Total Sum of the Multiplication you shall find in the Quotient the Multiplyer, as the Product of \$\frac{1}{2}\$ multiplyed by \$\frac{1}{2}\$ will be \$\frac{1}{2}\$, divide \$\frac{1}{2}\$, by \$\frac{1}{2}\$ thereof cometh \$\frac{1}{2}\$ as by practice will appear.

Division of Fractions.

I Rule.

To Divide Broken Numbers by Broken.

Set down your Divisor first towards your lest hand and your Dividend after it, then Multiply Crosswise the Numerator of your Divisor by the Denominator of your Dividend, and the Product is your new Denominator. Then Multiply the Numerator of your Divisor, and the Product is your new Divisor, and the Product is your new Numerator. Then Divide your new Numerator.

Numerator by your new Denominator if it may be divided or else Abbreviate them if they may be Abbreviated, and the Quotient or Abbreviation is your desire.

As if you would divide \(\frac{1}{4} \) by \(\frac{3}{3} \), fet them down in the order above directed, and Multipy them croffwife and you will find the Product to be \(\frac{2}{3} \), then divide 9 by 8 you will find 1 and \(\frac{1}{3} \), and fo often is \(\frac{3}{3} \) in

3 as appears by the Operation.

But if you will divide 3 by
4 fet down your Divisor and
Dividend in order accordingly, and Multiply Crosswife
as before directed, and you
will find them 3, as by the Operation
will appear.

2 Rule.

To divide a Broken Number by a whole Number, Or a whole Number by & Broken.

As if you would divide 3
by 13 fet 13 for your Divifor and 3 for your Dividend,
and Multiply crosswife as by
the first Rule of Division is directed.
and you will find 32, and your Division is
ended as appears.

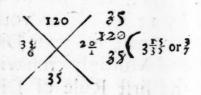
But if you will divide 13 by 3 you fet down your Divisor and Divi-

dend in a contrary Order and Multiply as before, and you will find the Product to be it, then divide 52 by

3, and you will find 17;, and so often is 4 in 13 as doth appear.

To divide whole Number by whole Number and Broken, or whole Number and Broken by whole Number.

As if you would divide 20 by 5 6, reduce 5 and you 3 fhall have 3 for your Divifor, and 2 for your Divi-



dend. Then Multiply crosswife and your Productwiss be 133. Then Divide 120 by 35 and you will find your Quotient 3 and 15, which being Abbreviated makes 3, and so is Fraction produced which makes 3 3 as appears.

But if you will divide 5²
by 20, change the order of fetting down your Dividend, and

Multiply croffwife as before directed

Multiply crosswife as before directed and you will find the Product to be 325 which you may Abbreviate, and thereof cometh 27 for your Quotient as will appear.

To divide a Broken Number by a whole Number and Broken, or whole Number and Broken by whole Number.

As to divide 4 by 133, fet them down your Divisor and Dividend in order afore-faid and Multiply croffwise as before directed, and you will find your Product to be as in the Margent.



But if you will divide 13[‡] by [‡] fet down, reduce and multiply them in order above directed and you will find the Product ^{16‡}, then divide 164



Product 164, then divide 164 by 9, the Quotient will be 183 as appeareth.

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5 Rule.

To divide whole Number and Broken, by whole Number and Broken.

As to divide 7½ by 13½, reduce the whole Numbers into their broken by the Do-trine of the fourth Reduction and you will find ½ for the 1½, and ¼ for the 1½, and Multiply crosswife as before, and thereof cometh 234 as appeareth.

But if you will divide 13\\ by 7\\\
change your order in \\
fetting them down \\
and Multiply croff-

wise as before, and you will find the Product to be 183, then divide 164 by 93, and you will find your Quotient to be 183, as will appear by Practice.

6 Rule.

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6 Rule

To divide by Broken Numbers of Broken.

You must reduce all your Broken Numbers into two Broken Numbers, one for the Divisor, and the other for the Dividend, and then work as in the aforegoing Rules. As if you will divide 4 of 3 of 2 by the 3 320 of 7, the three first Numbers being reduced into one Fraction will be 4, then the two latter reduced will be 2, set them down in order for your Divisor and Dividend, and Multiply Crosswife as in the aforegoing Rules, and you will find the Pro-

going Rules, and you will find the Product to be 122 for the Sum of this Divivision, as by the Operation will appear.

But if you would divide by to, reduce them as before fet them in the contrary Order and Multiply Crosswife as

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Rule.

325 13 8 241 (111) 45 129 129

above, and you will find the Product 189;

then divide 320 by 189, and thereof cometh in the Quotient 1135, as appears.

Proof of Division.

Multiply the Quotient by the Divisor, you shall find the Number divided, as if you divide ²/₃ by ²/₄ your Quotient will be ³/₅, then Multiply ³/₅ by ²/₄, the Product will be ²/₅, which being Abbreviated are ²/₅, and is the same with your Dividend.

Duplation, &c. of Fractions.

If you will double any Fraction or Broken Number, you must divide the same by ½. If you will triple it, you must divide it by ½, and for the Quadruple any Broken Number, you must divide it by ½. As by the Example of Duplation will appear. If you would double ½ you shall divide ½ by ½, and thereof cometh ½ which being Abbreviated make ¾ as by Example appears.

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Or otherwise if the Denominator be an even Number, you may only take the half of the Denominator, and let the Numerator still remain with the half of the Denominator, and the work is done which here you will find to be 4 as before, and if your Numerator be an odd Number Multiply it by 2 if you are to double it, or three if you are to triple it, &c. and let your Denominator stand the same and your work is sinished.

The Rule of Fellowship without Time Limited.

Set down each Mans Sum he layeth into Company directly under one another, then add them together, and the Total Sum is your Divisor, then Multiply either the gain or loss which of them shall happen by the Stock of Money each Man laid in, and divide it by your Divisor and the Quotient sheweth every Mans Profit or Loss. As two Merchants in Company the first laid in 500 l. the other 300 l. and with Trading they have gained 64 l. to know each Man's share of gain you must work by the Rule of Three, and say,

If

If 800?. gain 64 l. what 500 l? Anfwer 40 Pounds.

If 800 1. gain 641. what 3001? An-

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Swer 24 Pounds.

As by Multiplying and Dividing by the directions above, and according to the Doctrine of the Rule of Three will appear.

The Rule of Fellow (bip with time.

Multiply the Money each Man layeth in by the time it continueth in Company and what cometh thereof, is the New Stock for each of them. Then Multiply the gains by every of them feverally and the Product divide by all their New Stock or Layings in, added together, and you have proportionably each Man's part of the gain according to his Stock or Layings in; as, Two Merchants have accompanyed together, the first hath laid in 450 l. on the Ift. of January; the other hath put in 750 %. on the 2d. of May: How much shall each of them have of the 100 l. gained at the years end. Now the 450 1. continued 12 Months, and the 750 l. but 8 Months. Multiply the 450 by 12, and the Product is 54ce, and Multiply 750 by 8 and

....

and the Product is 6000, then add them together they make 17400 for your Divior, then Multiply rco 1. by 5400 and divide the Product by 11400 the Quotient will be 4742 L for the first Mans part of gain. Then Multiply 100 by 6000 and the Product divide by 11400 and the Quotient is 5213 for the fecond Mans part of the Gain, as by the Practice will appear.

If 11400 100 Lwhat 5400' Answer 4712 If 11400 100 %. what 6000? Answer 52'3

The Rale of Fastorage

This Rule is that the Estimation of the Body or Person of the Factor is in such Proportion to the Stock laid in by the Merchant, as the gain of the Factor to the gain of the Merchant. As if the Merchant deliver the Factor 2001. to employ, and he to have half profit, the Person of the Factor shall be valued 200/. But if Profit then he hath but half so much as the Merchant, who is to have ;, wherefore his Person is esteem_ ed but roo l. And if the Factor take ? of the gain, then the Merchant is to have wherefore to know the value of the Per-

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Person of the Factor say, If 3 give me 2 what 200/? work by the Rule of Tree and you will find 1333, as by Example.

If 3 give 2 what 200? Answer 1333.

Or otherwise consider that the Factor taketh $\frac{2}{3}$ of what the Merchant taketh, wherefore take $\frac{2}{3}$ of 200 l. and you will find 133 $\frac{1}{3}$, as before and so much is the value of the Person of the Factor.

The Rule of Barter.

To Exchange Wares for Wares.

Two Merchants will change their Wares, the one hath Cloth at 7 s. 1 d. the yard, to fell for ready Mony, but in Barter he will fell it for 8 s, 4 d. The other Cinnamon at 4 s. 7 d. the Pound to fell for ready Mony. To know how he shall fell it in Barter that he be no Say if 712 be fold in Barter for loser. 85 what shall 412 be fold for in Barter, reduce your whole Numbers and Multiply and Divide by the Rule of Three, and you shall find 5 s. 4 d. 17, and so much shall the Pound of Cinnamon be fold for in Barter. As will by Practice appear.

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If $7^{\frac{1}{2}}$ be fold for $8^{\frac{1}{3}}$, what $4^{\frac{1}{2}}$? Answer $5^{\frac{1}{3}}$.

And thus by changing your Numbers according to the Diversity of the Question you may work all other Propositions in Barter where no Money is paid.

To Exchange Wares for Wares, paying part ready Money.

When a Merchant overfelleth his Merchandice, and yet will have part ready Money, as 1 or 1 or 1 part, substract the Abatement from the just Price and also from the Over-Price, and the Remainders shall be the 2 first Numbers in the Rule of Three, and the just Price of the fecond Merchant shall be the third Number; as, if one hath Wool at 5 l. the C. Weight and in Barter will fell it it for 6 %. and yet he will have ; ready Money. The other hath Cloth of 13 s. and 4 d. the Yard to fell for ready Money. To know how he shall fell it in Barter, substract as above directed then reduce and work by the Rule of Three and you will find 17 s. 9 d. 3 for so much shall he fell it in Barter. As by the Operation will appear.

If

P 4

If 3 1. bring 4 1. what 13 s. 4 d. An-

1wer 175, 9d. 3.

And this may serve as a Rule for all Questions of like Nature. Changing the Operation as the Circumstances require and discretion will direct.

Exchange of Money.

I Rute.

At Antwerp they account by Deniers de gros, that is Pence Flemish whereof 12 make 15. and 20 Flemish do make 1 Li degros. As if I deliver in Flanders 500 l. Flemish at 19 s. 6 d. de gros that is 19 s. 6 d. Flemish to receive 20 s. at London. How much am I to receive? say if 19½ give ½ what will ½ give? reduce your Numbers, Multiply and Divide by the Rule of Three, and you will find 512 l. 16 s. 4 d. ½ of a Penny: As by Example appears.

If 19 = 20 what 100? Answer 512 h.

16 s. 4 d. 13.

If I deliver 375 l. in London to receive 21 s. 8 d. de gros for each Pound Sterling. How much in Flemish Money must I receive? I say, if rigive 11 what Multiply and Divide and you will find 407 l. 16 s. 3 d.

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I take up at Antwerpe 100 l. at 19 s. 6 d. Flemish to pay at London 20 s. Sterling. At the day of Payment I am forced to return the Money, and to take up Money in London to pay for 20s. here 19s.9d. at Antwerp, whether do I win or lose? Say if 19½ give 19½ what 100 ? Answer 98½, which being abated from 100 there remains 17, so much do I lose in the 100 l.

what 68com (which is and a

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into Shiloreis,) then makiply and divide

whele provided

4 Rule

The French Account by Crowns which are worth 50 Soufe Tournois the piece, and in France they Account by Deniers Tournois, whereof 12 make a Souse Tournois, and 20 Souse Tournois make 1 l. Tournois, which is a Livre or Franc. And the French Crown is current among Merchants for 51 Souse Tournois, but by Exchange it is otherwise, for they will deliver but 50 Soufe Tournois, which is 21. 10 Soufe Tournois for a Crown, and at such price the Crown as the taker up can agree for. If I deliver 340 1. Sterl. to have 6 s. 4 d. Sterl. the Crown to receive at Roan 50 Soule Tournois for every Crown, how many Livres Tournois must I receive for my 340 /? Say if 6 s. \frac{1}{3} Sterl. give me 2 l. \frac{1}{2} Tournois. what 6800 s. (which is 340 l. reduced into Shillings,) then multiply and divide and you shall find 2684 Livres . 4. And so much shall I receive in Roan or Paris for my 340 l. Sterling.

For Exchange of Money to Paris.

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Reduce the Sum Sterling you are to return into the lowest Denomination, and fet down that for your Dividend. Then reduce the price or rate of Exchange into the least Denomination if there be a Fraction, making your Dividend and Divisor of equal Denomination and that shall be your Divisor. And the Quotient of the Division will shew how many French Crowns you are to receive for the Sum Sterling you returned. And if there be any Remainder of that Division Multiply that by 60 because there are 60 Pence or Soufe in a Crown, and divide by the price of Exchange and the Quotient shews how many Soule you are to receive, and if there be any thing remaining of that Division, Multiply that Remainder by 12 and divide the Product be the price of Exchange and the Quotient will shew the Deniers to be received for that fum. I done to distort

For Exchangenoringilla to Paris.

The Rule of Alligation is fo called, because it teacheth in binding several parcels together of fundry prices to know how much you shall take of each Parcel. and is diffind in two parts. The First sheweth how to make a mixture of things of fundry prices and to know the common price of such mixture as, if a Man would mix 5 Bushels of Wheat at 25.8 d. the Bushelwith 9 Bushels of Rye at 25. the Bushel, what doth that mixture stand him the Bushel? Multiply every thing by its price and add the Products together and divide that Product by the Number of things to be mixed and the Quotient Answers the Question; as, Multiply 5 Bushels by 25.8 d. makes 135.4 d. Multiply 9 by 2 s. makes 18 s. which added together makes 31 s. 4 d. which reduced into pence are 376 pence, which divide by 14, the Quotient is 26 the worth of each Bushel. As will appear.

Allegation

5 B. at 2 5. 8 d. 13 5. 4 d. 192 9 B. at 2 0 18 0 376 14 31 4 344

2 Rule.

If you would mix feveral things of several prices but equal Portions together and know the price of the mixture: If there be two things add the prices to gether and take the half. If three things add the prices together and take i, and if four take a ; of the prices added together and so of others. As if there were a portion of Barley to be added or mingled at 20 d. the Bushel with the like quantity of Wheat at 25. 8 d. and Rye at 2 s. the Bushel, as suppose a Bushel of each were mingled add 20d.25. 8 d. and 2 s. together and they make 6 s. and 4 d. the 1 whereof is 2 s. 1 d. 3 which is the price of one Bushel of that mixture.

Note o

A Merchant hath 27 Pound of large Cloves at 6 s. the Pound. 15 Pound of middle fort at 2 s. 6 d. the Pound, and 20 th of Fust at 2 s. 2 d. the Pound, when all are mixed together he would know the price. Multiply every Drug by its price and then divide the Total Sum of the Products by the whole weight of the Drugs and you shall find 51 d. 25, and so much is a Pound of that mixture worth as by the Operation will appear.

4 Rule.

V

To mix ½ large Cloves, ¾ middle fortand ¼ Fust, take a Number hath those parts as suppose 12, whereof ½ is 6, ¾ is 4, and ¼ is 3, then Multiply each Drug by its price, and divide the Products, by the whole Sum of the Drugs, and you shall find 48 d. ¼, and so much is a Pound of that mixture worth. As by Operation will appear.

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And if you would make would make 100 l. weight of fuch mix-ture you shall 13. 100 \(\frac{6 \text{ Ans. 46.1}}{4 \text{ Ans. 30\frac{1}{3}}} \)

work by the Rule of Company and find 46% of large Cloves 30% of middle fort, and 23% of Fust.

A

A Goldsmith hath 3 forts of Silver Bullion, one 5 1.7 Ounces 10 d. weight at 7 Ounces 1 fine, another 12 1.3 Ounces at 6 3 Ounces fine, and 4 1. at 9 Ounces fine. Of what fineness will the mixture be when molten together. Multiply each Bullion by its fineness and add the Products. and they amount to 155 1. 23, then add the weights of the Bullion together, and they make 21 l. 3, then divide 15548by 218 and your Quotient will be 7 Ounces 12% remaining which being brought into Penny Weights and Grains do make 2 Penny Weight and 10 Grains and 37 of a Grain, so that you find the fineness of that mixture to be 7 Ounces, 2 d. 10 Grains and st of a Grain fine the Pound weight. Silver Weight is thus.

One Pound of Troy Weight is 12

Ounces.

One Ounce is divided into 20 Penny Weight.

One Penny weight into 24 Grains. One Grain into 20 smaller parts.

Gold Weight is thus.

One Ounce of fine Gold without Allay is 24 Caracts.

One Caract is 4 Grains.

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One Grain is divided into 2 half Grains, 4 Quarters of a Grain, &c. into imaller parts.

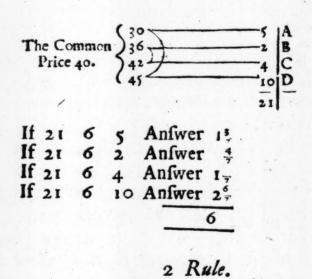
But if he would have added 5 l. of Copper to those Bullion, then he must have added the 5 l. and 212 and divided by 26%.

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The second part of the Rule of Alligations

The second part of this Rule sheweth how to bring a mixture of things of fee veral prices into one common Price certain; as, A Goldsmith hath Gold worth 30 Crowns the Pound, another fort worth 36 Crowns, another 42 Crowns, and another 45 Crowns, of these he is to make a Scepter 6 1. weight at 40 Crowns the Pound, how much must he take of each fort. Set down your Sums one under another with the common price 40 before them, and then always link the greater with a leffer Number, because of a greater and lesser may be made the mean or common Number. Then set the difference of the lesser Number from the common Price or Number, against the greater Number with which it is linked, and then fet the difference of the greater Number againA

against the lesser Number, linked with it, then add the differences together and the Sum shall be your first Number in the Rule of Three, the whole Massy piece which here is 6 l. shall be the second Number, each particular difference shall be your third, and your fourth Number sound shall shew the Portion must be taken of each particular, as by Example will appear.



A Mint-Master hath 4 sorts of Silver Bullion, first of 3 Ounces fine, second of 5 Ounces, third of 8 Ounces, fourth of a o Ounces fine. Of which he would make a sort but 6 Ounces fine. What Portion must he take of each fort. Set down

down your Sums and work as by the Rule in the lat Q eition is directed.

	The	several Prices.	Differences.
The Common Price 6.	\$ 3 5. 8 10		4 2 1

If you would make a mixture of 60 le of these sorts say,

If rol. give 60 1. what 4 1? Anf. 241:

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This Form may be varied by combining the particular Values after this manner.

3 Rule.

A Minter hath Gold 19 Caracts, 22 Caracts fine, and 24 Caracts fine, that is full fine without corruption, and he would make Coyn of 23 Caracts fine: How much must be take of each fort? Answ: Put the difference of 22 from ? 2

and 24 right against 16. And likewise the difference of 16 from 22 right against 32 and 24, as here you see.

A Goldsmith hath 3 forts of Silver, viz. of 6 Ounces fine, 7 Ounces fine, 9 Ounces fine, and would make Silver of 5 Ounces fine, he must mix Copper therewith and combining them thus, will shew how much of each fort.

A Merchant hath given order to his Factor to employ him 83 l. 6 s. 8 d. Sterlin five forts of Spices, followeth

Nutmegs 80 d. the Pound.

Cloves 76 d. the Pound.

Cinamon 52 d. the Pound.

Ginger 34 d. the Pound.

Pepper 30 d. the Pound.

How much must the Factor have of each fort to buy of each like quantity. Answer,

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fwer, add the prices together and divide the Product by the Sum of money laid out to be reduced into Pence, and the Quotient is your desire. As for Example divide 20000 d. by 272, and thereof comes 73 l. the Quantity he must buy of each fort.

But in case he would not take of each sort alike. Then take a middle value between the particulars, as suppose 50 d. then divide the 83 l. 6 s. (and reduced into Pence, viz. 20000 d.) by 50 d. and the Quotient will be 400, and so many Pounds must he have of all sorts together. Then to know how much or how many Pounds he must have of each sort, set them down, combine them and operate as by this Rule is before directed after this manner.



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The Rule of False Positions.

This Rule teacheth by Numbers supposed though never so Erroneous to find out the true Number required. And this of all vulgar Rules is the most excellent, and consists of 2 parts. The first of one false Position alone, the other of two Positions, and the Operation in a manner like to that of the Rule of Three only that hath three Numbers known, and this but one to work by, unto which we must devise 2 other Numbers the one multiplying and the other dividing. As by Examples appears.

Single False Position.

Question 1.

I have delivered to a Banker a certain Sum of Money to have 6 l. per Cent. per Annum, and at the end of 10 years he paid me 500 l. for all. How much was the Sum I delivered? Here are divers Terms, but the chief to work with is 500, which cometh of the other Numbers 10 and 100: now let us suppose a Num-

Number and work therewith, as if it were the principal Sum we feek for; as for Example, suppose I delivered to him 2001: the 10 years of it will amount to 1201. which added to the 200 makes 320 whereas I should have 500, so that I have erred in this supposition 180, yet however I have hereby three Terms of the Rule of Three sound out, whereby I may produce a sourth, which shall be the true Number I seek for, as will appear by the Operation when I state my Question thus and say.

If 320 1. come of 200 1. of how

(much) 500 l. Answer 312 l. 12.

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Which 312 1. 1/2 is the true Sum I delivered at the first, as by the Multiplying and Dividing according to the Rule of Three will appear.

Question 2.

A Traveller found so many pieces of Gold that the half third and fourth parts made 50, now what was the Sum sound First I suppose the Sum he found which hath those parts to be 12, the half where-of is 6, the third part 4, the sourth part 3 which added together make 13 but I seek 50, and therefore I have erred in Q 4

my Conjecture, yet this Error leads me to the Truth when I consider that as 13 the Sum of the parts of my false Conjecture, are to the whole Sum 12 so the parts of the Sum sound which being added together make 50, ought to be the Sum sound which is yet unknown. Therefore I say,

If 13 12 50 4611.

Question 3.

It is required of what Number 5 will be two thirds. I suppose 6, but find 2 thirds of 6 but 4, therefore by the Rule of Three I say, If 4 6 5 7½.

Question 4.

Two Numbers are to be fought out in which ½ and ‡ of the one Number are ‡ and 5 of the other, I suppose 54 whose ½ and ‡ part make 45, and then I seek a Number, of which 45 will be ‡ and 5 and suppose of 60 that being a Number which hath a fourth and a fifth part to be taken in whole Numbers, and find the ‡ and 5 of 60 to make but 27, but I sought 45, therefore by the Golden Rule I state my

my Position thus, and say, if 27 60 45 100, and thereby I find that 54 and 100 are the 2 Numbers sought.

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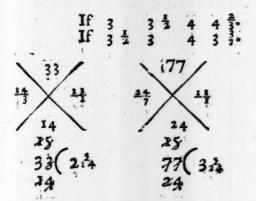
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Question 5.

If 3 were the half of 7 what part would 4 be of 11? This is an ambiguous Question, for if 3 do increase to 3½, then by the Rule of Three you will find 4 to increase to 4½, and then divide 11 by 4½ and you will find your Quotient to be 2½, and that part will 4 be of 11. But if you will have 3½ to Decrease to 3, then you will find 4 to Decrease to 3½, and Divide 11 by 3½, and you will find your Quotient 3½, and that part would 4 be of 11, as by the Operation appears.



Question

Question 6.

I have a Ciftern with 3 unequal Cocks containing 60 Pipes of Water, and if the greatest Cock be opened it will avoid in an hour, at the fecond in 2 hours, and at the third in 3 hours. Now in what time will it avoid if all the Cocks be open? Suppose in half an hour, then must there avoid at the first Cock 30 Pipes, at the second 15 Pipes, and at the third 10 Pipes, which being added together make but 55 Pipes, whereas it should be 60 Pipes. Therefore by the Golden Rule I fay

If 55 30 60 32 55 17.

In which space of 32 Minutes and or Abbreviated of a Minute will the Ciftern be emptied if all the Cocks were set open.

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Double False Positions.

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The Rule of two falle Politions is when a Question is propos'd. First imagine a fum at pleafure which you name your first Position and work with the same instead of the true Number as the Queftion doth import. And if you have missed the true you seek, observe how how much and Note the fame with this Mark P fignifying Plus if more, or with this Mark M fignifying Minus if less. Then begin again and suppose another Number which you must call the fecond Polition, and work the fame as before, and note the Error how much or how little, and fet the fame down with its mark on the other fide of the Cross. as you see them in the Examples following. Then shall you Multiply Crosswife the first Position by the second Erfor, and fet the Product over the first Position. Then likewise Multiply the fecond Polition by the first Error and fet that Product over the fecond Polition. Then if the figns of the Errors be both too much, or both too little, then you must substract the one lesser from the greater, and keep the Residue for your Dividend, and then substract the lesser Error from the greater, and keep the ReRemainder for your Divisor, then divide and the Quotient is your true Number sought. But if your signs of your Errors be one greater and the other lesser, then instead of substracting you must add the Products of your Cross Multiplications together, and keep that Product for your Dividend, and likewise add your two Errors together, and keep the Product for your Divisor, then divide, and your Quotient is the true Number sought for. As by Examples will more plainly appear.

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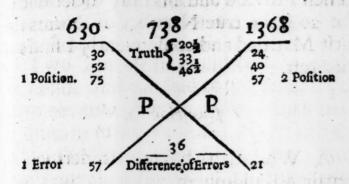
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A Man at his death gave 100 Ducats to three Friends in this manner. The First to have a certain Portion; the second twice so many as the first abating 8 Ducats, and the third three times as many as the first abating 15 Ducats. Now how many must each of them have? First I suppose the first Man had 30 then by order of the Question the second must have 52 and the third 75, these added together make 157, but I must have but 100, therefore this first Supposition hath erred 57, therefore I set down my Position 30 with his



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his Error 57, and fign P fignifying too much as you fee. Then I proceed and suppose again that the first Man had 24, then the second must have 40, and the third must have 57, which added together make 121, and I must have but 100 fo the fecond Error is too much by 21, therefore I fet down my second Position with his Error and fign P fignifying too much on the other fide of the Cross as here you fee. Then I Multiply Crosswife my first Position 30 by my second Error 21, and thereof cometh 630, likewife I multiply 24 my fecond Polition by 57 my first Error, and thereof cometh 1368. Then because the signs are both alike, I substract 630 from 1368 and the Remainder is 738, which is my Dividend. Then I substract 21 my leffer Error from the greater 57 and the Remainder is 36 for my Divisor. Then Then I divide and find my Quotient to be 202, the true Number of Ducats the first Man had and consequently I find out the rest.

Question 2.

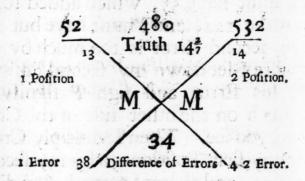
A Workman having undertook to repair a Building in 30 days, was urged to finish it instantly, whereupon he did require for every day he did work 18 Shillings, and for every day he neglected he was contented to return his Ma-

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fter 13. Now he worked so many days and played so many, that the Building being finished he had nothing due to him. Now I demand how many days he wrought, and how many he played? And by the Operation it appears that he wrought 1412 days, and that he played 1522 days as you see.

Question

Question 3.

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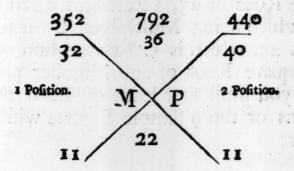
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Two Travellers found certain pieces of Gold, and one faid to the other if you give me two of your pieces I shall have 3 times as many as you. Nay faith the other 'twere more reason, our sums were equal and so will it be if you give me 3 of your pieces. Now how many pieces did each find? I search and sind that the one found 7 and the other 13 pieces.

Question 4.

A Traveller passing by asked a Soldier how many Men were in their



Com-

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Company: He answered if there were so many more, half so many more, and the fourth part of so many more, we together with thy self should make 100. Now its demanded how many were in the Company. I search and find it to be 36.

Extraction of the Quadrate or Square Root.

A square Number is the Product of a Number Multiplyed by it self, and confequently to extract the square Root of a Number is to find out a Number, which being Multiplyed by it self doth produce the Number proposed. As for Example being desirous to draw the square Root of 25, I search for a Number, which being Multiplyed by it self makes 25, which is 5. But to find out the Square Root of any Number proposed you must first learn by heart the Squares of the 9 Simple Figures which follow.

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Square Roots.	I	2	3	4	5	6	7	8	9
SquareNumbers	1	4	9	16	25	36	49	64	811

And now if one is defirous to mark in the Fields a square piece of Ground containing 531441 fquare yards how long shall every side be. To do this I must find out the square Root in this manner First I set down my Number Ma ked and Divided as hereafter you fee. Then I seek the Square Root of the next square Number I can have in 53 which I find to be 7, for 7 Multiplyed in it felf makes 49, which is the greatest square Number I can have in 53, therefore I fet down 7 in the Quotient betwixt and likewise underneath, and then I Multiply 7 times 7 that makes 49, which Itake from 53, being the Figures in the first Division, and which stand over it, and there rests 4 which I ser overhead: Then I double my Quotient 7 and that makes 14, the 4 I fet down one place forwarder, and then the I will come back to stand under. Then I consider how I may have another Digit which Multiplyed by it felf, and likewise with the double Number 14 I can take from the Figures over, and I find fuch Digit to R

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be 2, wherefore I fet down 2 betwixt the Lines in the next void space for my Quotient, and likewise underneath, then Multiplying 142 by 2 the Quotient and the Product will be 284, which I Substract from the Figures directly over it, which are 414, and there will remain 130, which I fet over head as you see, then I double my last Quotient 2 which makes 4, and fet it down with the other Figures one place forwarder, and feek for another Digit which being Multiplyed by it self together with the other Figures might be taken from the Figures over them, and I find the greatest I can take to be 9, therefore I set down 9 in the last void space for the Quotient and like wise underneath, and then the Figures underneath will 1449 which Multiplyed

which being the last Division, I set down underneath and substract from 13041 which are the Figures over it, and nothing remains. Therefore I conclude that 729 which is my Quotient is the square Root or

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And now laftly for Proof of my Operation I Multiply 729 by it felf, and find the Product to be 531441, the fame with my Number first propofed, therefore I fet the fame down underneath as you see, and am assured that I have done right.

And if I defire to know how many square Perches, Yards or Feet are in 9 Acres of Ground. And likewise to extract the square Root or side of the same in Perches, Yards or Feet. know how many square Perches I set

down 60 the Number of Perches in an Acre, and Multiply it by 9 the Num-5 71 ber of Acres and the Pro-14 40 71 duct is 1440 which is the 3 7 74 Number of fquare Perches 3 67 in 9 Acres of Ground. Now 4 69 to find out or extract the square Root or side of this

Number 1440 I set down that Number and work as in the Example aforegoing is directed. And find the nearest square Root to be 37 in this

manner.

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But

But this not being an even Square Number there being 71 remaining I set it down over the middle Line without and then doubling my last Quotient 7 I set that with the other Figure 6 added which makes 74 underneath that Line which is 74 of a Perch and thus have I done.

Extraction of the Cubique Root.

As the Square Root is a Number which being multiplyed in it self doth make a square superficial Number having only length and breadth, so the Cubique Root is a Number which being first multiplyed in it self, and the Product thereof being again multiplyed by the first Number doth make a Cubique Number having both Length, Breadth and Depth, as 2 times 2 makes 4, and 2 times 4 makes 8, and so of the rest, as by this Table of Square and Cubique Numbers will appear.

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Roots.	1 1 2	31 4	51	61	71	81	91
Square Numbers.					491	64	81
Cubique Number.							

Now being to find out the Cubique Root of any Number greater than 1000 (for leffer it cannot be to work upon) First set a prick under your first Fig.re on your right hand, and so proceed towards your left hand, omitting always 2 Figures, as here you fee, 41063625, then fo many pricks fo many Figures shall you have in the Quotient, then by your Fable you are to find out fuch a Cubique Number as will take away as much as may be of the Number or Figure right over your first prick towards the left hand with the Figure before it (if any be) which in this Example is 41 and the Cubique Number which will take away the greatest part of it, which may be had is 27, the Foot whereof is 3, therefore I fet down 3 in the Quotient as here you fee, and take the Cubique Number 27 41063625(3 Triple · 9 which comes thereof out of 41, and Divisor 27 there remains

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which I fet overhead, then I triple the Quotient which makes 9, and fet that down under 6 next to the second Prick on the left fide thereof. Then to find out the Divisor I multiply the triple 9 by the Quotient 3 and the Product 27 is my Divisor, which Divisor I place right under the Triple, one Figure shorter towards the left hand. Theu I draw a Line and ask how many time 2, which is the first Figure of the Divifor, is there in 14, and I must take such a Digit as may not take it all away, but leave so much, that the Quotient being afterwards Multiplyed divers ways may take away the rest, and I find the fittest Digit for this purpose to be 4 which I put in the Quotient and fo make my Quotient 34, then I Multiply this last Quotient which is 4 into the Divisor 27 which produceth 108, which I fet down the Divisor beneath the Line as you may fee. Then I multiply the 4 Quadratly in it felf which makes 16, then I multiply that 16 by the Triple 9, the Product whereof is 144 which I fet under the Triple as you fee. Then I Multiply the 4 Cubically in it felf which makes 64 which I fet underneath the next Prick on the right hand, as here is done.

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done. So as every of the aforesaid Products extend one further than another

towards the right hand. Now these Products being thus placed I draw another Line underneath and bring all the 3 Products betwixt the Lines into one Sum, and I find it

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14759 4106325(34 Triple 9 Divifor 27 108 144 64

12304 to be 12304 which being substracted out of 14063 which is over it, there will remain 1759 which I fet down. Then to avoid Confusion I set down my Remainder in a new place, and proceed to find out a new Triple, and a new Divifor which I do thus. Multiply the whole Quotient 34 by 3, the Product is 102 and that is the Triple which is to be placed in the next void place just before the next Prick on the right hand. Then Multiply the whole Quotient into the Triple 102, the Product whereof which will be 3468 shall be my Divisor, which I place under the Triple one Figure shorter towards the left hand with two R 4

two Numbers thus found, and rightly placed I draw a Line, then I ask how many times my first Figure of my Divisor, which is 3, is in the Number

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over it, which is 17, which I find to be 5 times, wherefore I fet 5 in the Quotient, and Multiply that 5 unto the Quotient, and place the Product thereof, which is 17340, right under the Divisor beneath the Line, as in Example you fee, Then I square 5, that is I Multiply it in it felf and it makes 25, which I Multiply again into the Triple 102 the Product is 2550, which I fet down right under the Triple beneath the Line, then I multiply the faid 5 Cubically in it felf which makes 125 which I place right under the first prick on the right hand, then I draw a Line and add the 3 Products together, and find the Total Sum to be 1759625, which being Substracted from the upper Number, there remaineth nothing, whereby I find that 41063625 is a perfect Cubique Number, for if I Mul

Multiply the Quotient 345 Cubically in it felf, it will make the fame Number, as by the Operation will appear.

Now if I have to deal with a few Numbers and the Divisor cannot be had in the Number over it, I must set a Cypher in the Quotient and so I have done. As for Example, being to extract the Cubical Root of \$567, I find 2 to be the Quotient, which being Cubically Multiplyed in it self, doth wholly take

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I fet down a Cypher which in the Quotient makes my Quotient 20, the Cubical Root of the afore-

faid Number, for if 20 be Multiplyed Cubically in it felf and 567 which is the

Remainder added thereunto it makes \$567, as by

Example appears.

8567 6 Triple (20 12 Divisor

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The Virgins Rule.

A Man bought 20 Fowls, cost 20 d. Geese at 4 d. a piece, Partridge at 1 Penny a piece, and Larks at 1 a piece.

Now how many were of each fort?

First reduce all into Farthings, then observe the difference of the least prized Fowl from the two greater prices as the difference of 1 Farthing from 2 which is 1. Then the difference of one from 16 the price in Farthings of the greatest Fowl, and that is 15, then suppose there were 20 of the least priced Fowl or Larks, the price will be 20 Farthings, which if you take from 80 Farthings, there will remain 60 Farthings which divide into 2 fuch Numbers that the one may be divided by 15, being the one difference, and the other by I the other difference of the prices, and there will remain nothing, and these two Numbers you will find to be 45 and 15, then divide 45 by 15, and the Quotient will be 3 which is the Number of Geese, then I should divide 15 by 1, but because I neither Multiplies nor Divides, I find

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15 is Partridges, and the rest of the 20 Fowls which is 2 I find to be the Number of Larks.

And now having gone thro' the main Body of Arithmetick I shall proceed to some few

Arithmetical Questions, both delightful and profitable, all of them performed without Algebra.

Question 1.

A Schollar agreed with a Man, who had 7 Persons at his Table to give him so much as he demanded for his Board for a year, provided he would board him for the same Money, so long time as he could place those 7 Persons daily in a several and distinct order. How many days might the Scholar board there? Answer 5040 Days, that is 14 Years wanting 70 Days.

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To effect this you must still Multiply your preceding Product by the Figure sollowing. Thus at the first Day they

fat in order, 1 2 3 4 5 6 7, the fecond Day Multiplying 1) 1 by 2 makes 2, and fo 2 2) Changes may be made of 2 Persons 1 2, 21, then Mul-3) tiply this Figure by the next Day or 3, and it makes 6, 4) and 6 Changes may be made of 3 persons, as 1 2 3, 132, 213, 231, 312, 5) 3 2 1, then Multiply this Number 6 by the next Fi-720 gure 4, it makes 24 Changes, that by 5 makes 120, that by 6, 720, that by 7, 5040.

Like to this is the Changes on Bells, 8 Bells making 40320 Changes, and 12 Bells 479001600 Changes. And the 24 Letters may be changed to 24 Places, making Millions, of Millions, of Millions and more. And the Gamut may be varied to 22 places.

Question

Question 2.

A Country Farmer had a Vessel of Wheat 4 foot high, and 4 foot broad at top and Bottom, his Neighbour borrows half his Wheat till Harvest, and then makes a Vessel 2 foot every way (as the Farmers was 4 foot every way) and filling that twice, gave it in lieu of what he borrowed, whereby the Farmer lost 12 Bushel.

Question 3.

A Greyhound courseth a Hair in such sort that the Hare taketh 5 Leaps for every 4 of the Greyhound, and is 100 Leaps from the Greyhound. Now if 3 of the Greyhounds Leaps, be equal to 4 Leaps of the Hare, the Question is in how many Leaps the Greyhound will obtain his Prey. Answer 1200 Leaps.

If 3,4,4, 5 ¹/₃ therefore the Greyhound in every 4 Leaps gets ¹/₃. Then fay if ¹/₃ 4 100 1200.

Question 4.

A Man bought and fold both at a Rate, and yet was a loser, viz. he bought 120 Apples at 3 for a Penny, and 120 at 2 for a Penny, and fold them again at 5 for 2 Pence, and thereby lost 4 Pence,

Question 5.

Being the Fishermans Question,

I caught a Fish, (others among)
Whose Head was full sive foot along,
And his Tail was (truly)
As long as his Head and half his Body,
And his Body (without fail)
Was just as long as his Head and Tail.

This is my Question,
Resolve it who can
How long was the Body
And Fishes Tail than?

Multiply the length of the Fishes Head by 3, by 4, and by 8 the one ProProduct shall be the length of the Tail the other the length of the Body, and the third will be the length of the whole Fish. So the Head being 5 Foot, this Multiplyed by 3 giveth 15 Foot for the length of the Tail. Again Multiply 5 by 4 it produceth 20 for the length of the Body. And Lastly Multiply 5 by 8 it produceth 40 for the length of the whole Fish, and exactly Answers the Question.

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Question 6.

The Shadow of a Steeple being 260 Foot from the Bottom, when the Shadow of a Rule 2 Foot long is 3 Foot. How high is the Steeple? Answer by the Rule of Proportion 86? Foot.

Question 7.

A Draper demands 12 d. a yard for Cloth. The Chapman faith I will give 2 s. the yard provided every Angel of my Money may go for 20 Shillings. To which the Draper agreeing, he bids him cut off five yards, Then laying

ing down an Angel which being to go for 20 s. he requires him to give him the rest again, so that he got his Cloth for nothing.

Question 8.

To find the Number any person thinketh upon without asking any Question.

Let the Party Multiply the Number thought upon, by what Number he pleaseth, and Divide the Product by what other Number he will. let him Multiply this Quotient by what Number he please, and Divide that Quotient by what other Number he thinketh fit, and fo Multiply and Divide as many times as he please (only let him tell you by what Number he Multiplies and Divides) and when he hath Multiplyed and Divided as often as he listeth, bid him divide his last Number by the Number he thought upon and keep the Quotient to himself. In like manner do you take any Number and privately Multiply and Divide and by it as often as he doth; the fame Number he doth, and when you have done it as often as he hath done,

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done, and Divided your last Number by the Number that you supposed, your last Quotient will be the same as his. Then to know the Number he thought upon at first, bid him add his last Quotient to his Number he thought upon and give you the Sum from which Substract your last Quotient and the Number which he thought upon will remain.

Another.

Bid him add to the Number thought (as admit 15) half of it, if it may be if not, the greatest half that exceeds the other but by an Unite, which is 8 and it makes 23, unto this 23 add the half of it, it it may be, if not the greatest half, viz. 12 makes 35 in the mean time. Note, that if the Number thought upon cannot be halved at the first time, then for it keep 3 in memory, if at the second time reserve 2 in memory, if at both times it could not be equally Halv'd then may you together referve 5 in memory, this done, cause him from the last Sum, viz. 35, to substract the double of the Number thought; viz. 30 then will rest 5, will him to take the half of that if he can, if not, reject one and then take the half of the rest, which keep in your memory, then will him to take

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take the half again if he can, if not, take I from it, which referve in your memory, and fo perpetually halving until I remain, for then mark how many halves there were first taken for the first half account 2, for the fecond 4, for the third, 8, &c. and add unto those Numbers the one's, which you referved in So there being 5 remaining memory. in this Proposition there were 2 halvings, for which last I account 4, but because it could not be exactly halved without rejecting of i, I add the i therefore to this 4 which makes 5, which half or Sum always multiplyed by 4 makes 20, from which substract the first 3 and 2, because the half could not be formerly added, leaves 15, the Number thought upon.

Question 9.

A Debtor owing a Sum of Money, his Creditor condescends to his paying 5 s. the first Week, 10 s. the second, 15 s. the third, &c. still advancing 5 s each Week for one Year. Now to know how much is received at the Years end, (for to add 5 s. 10 s. 15 s. 20 s. till you come to 52 Weeks which makes up a year

year would be tedious) Multiply 52 the Number of Weeks in the year by 5 the increase every Week, the Product is 260 which is equal to the 52th. Number if you had added the Sums together. Secondly to this 260, add 5 (the increase for one Week) it makes 265 which Multiply by 26 (half the Number of Weeks in the year) and it produceth 6890 s. which is 344l. 10 s. and so much will the Creditor have received of his Debtor at the years end.

For more of these and the like Questions see hereaster in Geometry, in my Book called The Gentlemans Treasury, and in Leybourn's Arithmetical Recreations, also Henry Van Ettens Mathematical Recreations, and many of the A-

rithmeticians Books.

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A Table for the Ready Casting up of any true Value for any Quantity of Goods or Commodities Bought or Sold by the Pound, Yard, Ell, &c.

The use of the following Table is very plain, and of great use to all, but especially to such as are not exercised in Casting up Accounts, for the certain Understanding whereof, take this one

Example.

At 7 d. the Pound, what must I give for 7584 Pound?

It is required to know what 7584 Pound of any Commodity will cost at 7 d. the Pound, I look in the Table for the Column of 7 Pence, and because

7000—204 03 04 500—14 11 08 80—02 06 08 4—00 02 04 7584—221 04 00

I cannot find fuch a Number as 7584 in the Table at once, therefore I look for 7000 first, which I find out in the lest side of the Table under the Title Number of Pounds, Yards, &c. and against

it in the 7th. Column I find 204 03 04, which I fet down, and look for 500, and in the 7th. Column find 14 11 08, which I also set down, and in like manner I find 02 06 08 to stand against 80, and 02 s. 04 d. against 4, which I set down one under another as you see, and then by Addition find the Total Sum to be 221 l. and 04 s. And so much is 7584 Pound of any Commodity worth at 7 d. the Pound.

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Number	I	Fai	ething	3. 1	2	Fart	hings	. 1	3 Farthings.				
of Pounds Yards, Igc	1.	s.	d.	f.	1.	5.	do	f.	1.	s.	d.	f	
		-		1		-		2					
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30			7	0		1	3	0	- 1	2	10	2	
40			10	2				0				C	
50		1	0	0		2	1	9		3	1	2	
60	1	I	3	1		2	6	0		3	9	C	
70	3	I	5	2		2	11	0		4	4	2	
80	2	1	8	0		3	4	0		5	0	(
90	4	1	10	2		3	9	0		5	7	2	
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10000	10	8	4	0	20	16	8	0	31	05	0	****	

Number of		1 Penn	_	1_2	Pence	1000	3 Pence.			
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1			1			2			3	
2			2			6	1		3	
3 4			3			6			9	
4	-		4			8		1	0	
5			6	1		10		1	3	
			6	1	1	0		1	6	
7 8			7		1	2		1	. 9	
				1	1	4		2	0	
9			9	1	1	6		2	3	
10			10	1	1	8		2	3	
20		I	910	1	3 5 6	4		5	0	
30		2	6		5	0	1	7	6	
40		3	4			8		10	0	
50		4	2		8	4	1	12	6	
60		5	0		10	0	1	15	0	
70		5	10	1	.11	8	ľ	17	6	
80			8		1.3	4	1	00	0	
90		7 8	6	1	15	0	1	02	6	
100		8	4		16	8	1	05	9	
200		16	8	1	13	4	2	10	0	
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1000	4	03	4	8	05	8	12	10	0	
2000	8	6	8	16	13	4	25	00	0	
3000	12	10	0	25	10	0	37	10	0	
4000	16	13	4	33	06	8	50	00	0	
5000	20	16	8	41	13	4	62	10	0	
6000	25.	00	0	50	00	0	75	00	0	
7000	29	03	2. 1	58	06	8	85	10	0	
8000	33	06	8	66	13	4	100	00	0	
9000	37	10	0	75	00	0	112	10	0	
10000	41	13	4	83	06	8	115	00	0	

Number of	4	Pence.		5	Pence		6 Pence.			
Pounds, Yards, &c.	1.	s.	-d.	1.	5.	d.	1.	s.	d.	
1			4 8			5		-	6	
2						10		1	0	
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4		1	4		1			2		
5		1		1	2	1		2		
	- L	2	0		2	6		3	•	
7 8		2	4		2	11		3	1	
		2	8	-	3	4		4	(
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10		3	4		4	2		5	•	
20		6	8	1	8	4		10	•	
30		10	0	1 13 8	12	6		15		
40		13	4		16	8	1	00	(
50		16	8	1	00	10	1	05	(
60	1	00	0	1	05	0	1	10	0	
70	1	03	4	1	09	2	1	15		
80	1	06	8	1	13	4	2	00	-	
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100	3 5	13	4	2	OI	8	3	10	•	
200	3	06	8	4	. 03	4	5	00	(
300	5	00	0	6	05	0	7	10	(
400	6	13	4	8	06	8	10	00	(
500	8	06		10	08	4	12	10		
600	10	00	0	12	10		15	00	(
700	11	13	8	14	11	8	17	10	•	
800	13	06		16	13	4	20	00	•	
900	15	00	0	18	15	0	22	10	•	
1000	16	13	4	20	16	8	25	00		
2000	33	06	8	41	13	4	50	00		
3000	150	00	0	62	10	0	75	00		
4000	66	13	4	83	06	8	100	00	(
5000	83	06	8	104	03	4	125	00	(
6000	100	00	0	125	00	0	150	00		
7000	116	13	4	145	16	8	175	00		
8000	133	06	8	166	13	4	200	00	•	
9000	150	00	0	187	10	0	225	QO	0	
10000	166	13	4	208	06	8	250	00	0	

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0	600	17	10	0	20	00	0	2.2	10	0
	700	20	08	4	23	05	8	26	05	0
	800	1 1 1	06	8	26	13.	4	30		. 9
		- 33		20	30	00	0	33		0
4	900	2.6	95	0		06	8	37	To	.1
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	2000	53	06.	8	, 96	13		75		
	3000	37	10	0	100	00	0	132	-10	0
	4000	116	13	4	133	26	8	150	00	0
	5000	145	16	8	106	13.	4	187	10	0
1	5000	175	00	0	200	00	0.	225	00	0
	7000	204	.03	4	233	06	8	262	-10	5
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lumber of		10	Pence			11	Pence.		i ommis.		
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4		13	3	4	-	43	3	8		4	0
5	1	10	4	2	1		14	7		.6	0
6	1		5	9			5	6		.6	0
7	1		5	10			6	5		7	0
8	1		. 6	8	1		7	4		8	0
9	1		7	6			8	3		9	0
10	1		. 8	4			9	2	- 1	10	0
20			16	8			18	4	1	00	C
30	1	1	05	D		I	07	6	I	IO	0
40	1	1	13	4		1	16	8	2	00	0
50	1	2	OI	8		2	05	LO	2	10	0
60	1	2	10	0		2.	15	0	3	00	. (
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80	1	.3	06	8		3	13	4	4.	00	-
90	1	3	15	0		4	02	6	4	10	(
100	1	4	03	4		4	11	8	5	00	0
200	1	8	06	8		9	03	4	10	.00	(
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1000	250	00	0	300	00	0	350	00	0
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GEOMETRY.

The Greek Temperela, ex na seus vii i. Terra, & usresa, i. Metior. A Measuring of the Earth and Figures; and as Number and Multitude is the Subject of Aithmetick, so is Magnitude and Greatness the Subject of this Science, which Philo the Jew calls the Principle and Mother of all the Arts, and hath this Excellency above the rest, that whereas there are manyfold Contentions among the Professors of all other Arts, the Mafters of this Science generally agree in their Problems; neither is there any great matter of Debate among them, but only as to Points, Lines, and Superficies, whether they be divisible or no

no. To this Science belongs the mak ing of all Mechanick. Engines and Instruments appertaining to the Mechanick Arts, all Engines of War, and Archite-Aure, also Painting, Agriculture, Menfuration of Land, Timber, Stone, Oc. and all Smiths and Carpenters work; also Souldiers and Commanders should beskilled herein, fince they cannot with. out some privy Rules and the knowledge of some principles in Geometry Fortify, order their Battalia in Square, Triangle, Cross, Crescentwise and many other Forms, Jovius sheweth, nor level or plant Ordnance, Undermine, raise Bulwarks, Rampires, Casamates, Ravelines with many other means of offence and defence by Fortification, &c. Likewife all Musical Instruments, Clocks and Rarities done by Hydraulick Art, &c. borrow their experience from this Science for many admirable performances in this Art see my Book called The Gentlemans Treasury.

There are three kinds of Principles whereon the Demonstrations (which in this Science are always used thereby to explain their Theorems and Propositions) of all Geometrical Conclusions de-

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pend, viz. Definitions, Petitions and Maxims, of the first it being of great use and necessity in the attaining to the Knowledge of this Art I shall treat somewhat of, Referring you for the rest to Euclid his Elements translated into English, as also Cook's principles of Geometry, Blundeville's Exercises and many other of the Mathematicians Books. In Latin you may have the Learned Jesuit Clavius, Melanethon, Frisus, Valcarius his Geometry Military: Albert Durer hath writ hereof in High-Dutch, and Forwadelle in French with many others.

Definitions in Geometry.

A Point in Latine Punctus is a thing supposed to be indivisible having neither length, breadth or depth, A as the Point A.

A Line in Latine Linea, is a supposed length having neither A-B breadth nor thickness, as the Line A-B. which is called a right Line.

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A Crooked Line goeth and is either a whole Circle, (which Line is fometimes called the Periphery of a Circle) or is only a part or portion of a Circle, or elfe goeth Serpentine winding in and out as a Serpent, and this Line is called Linea Tor-

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tuosa: Or else is a Line which winds about inwards like the Shell of a Snail, called in Latine Linea Spiralis, as the Figures do shew.

Superficies, or Upperface, is that which

only hathlength and breadth without depth, and is two-fold, Plain and Crooked.

A Plain Superficies is that which lyeth strait betwixt his Lines (for the bounds of



Superficies are Lines) as the Figure A. and a Crooked! Superficies is that which goeth Arched or Bowing, and lyes not strait betwixt his Lines, as the Figure B. And this Arched Superficies is considered t wofold for the upper part is said to be Convex, the inner part Concave-

A Plain Angle is when 2 Lines being drawn upon a plain Superficies not directly one against another, but so as by meeting one another in a point they make an Angle in the manner as you see in

the Figure C. Of plain Angles some are called right Line Angles, some crooked Line Angles, and some mixt; the reason whereof may be seen in the Figures D. E. F. A Blunt Angle, called also an obtuse Angle, is that which is greater than a right Angle, as the Angle G, and a Sharp or Acute Angle is lesser than a right Angle, as the Figure H. Spherical or Round Angles consist of two Circular Lines drawn upon

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a Spherical Superficies, which cross one another in some point either Right or Oblique; if right they make right Angles, as the Figure I. sheweth; if Oblique they make sharp and obtuse Angles as the Figure K. may partly shew, but such Angles cannot be so well described in Plain as upon the Surface of some Spherical Body.

A Term in Latine Terminus, is the bound or limit of any thing, as Points are the bounds of Lines, and Lines the bounds of Superficies, and Superficies the bounds of a Body, which is that which hath (imaginatively, but not materially) both length, breadth and depth, and if such Body have many Faces or Sides, then it is bounded with many Superficies as the Figure L. (which is a Cube like a Dye) doth shew; but if such Body be round as a Globe, Bowl, &c. then is it bounded or cover-

cies as the Figure M.

A Circle is a plain Figure bounded with a Circular Line which is called a Circumference, the middle point whereof is called the Center, and a right Line passing thro' the Center is called the Diameter.

ed with but one Superfi-

A Semi-circle is a Figure contained within the Diameter and half the Circumference of a Circle, as the Figure N.



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Four Square Figures are bounded with 4 right Lines as the Figure O. Another is called a Parallelogram or Long Square as the Figure P. Another Romboides as the

Figure Q. Another fort isbounded with more right Lines than four as the Fi-

gure R. All other forts are called Trapezia as S. and the like, except one called Rombus, in Heraldry named a Lozenge and shaped like a Diamond as the

Figure T.

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Triangles or three Corner'd Figures are of fix kinds, 1 Isopleurus having 3 equal sides and 3 equal Angles as V. 2 Isosceles having two equal

Isosceles having two equal sides and Angles as U. 3. Scalenos having no side equal one to another as W. 4 Orthogonius having one right Angle as X. 5 Ampligonius having one Blunt

Angle as Y. 6 Oxygonius
having three tharp Angles, but no

having three sharp Angles, but not equal sides as Z.

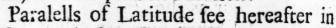
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Parallels are two Lines equally distant,

which being drawn forth infinitely, would never meet or touch one another in any part. As may be feen by the Examples in the Margent of Right Line Paralells, Circular Paralells, and Serpentine Parallels.



Aftronomical Definitions.

And now tho I mean not to run o're all the common Elements in Geometry of which you may find enough in Euclid and others, yet for the satisfaction of the more Ingenious disposed in this Art I will here insert some

Curious Problems in Geometry.

How with one and the same Compasses, and at one and the same Extent or Opening, to describe many Circles Concentrical, that is greater or lesser than one another.

Tho many may admire how this Proposition is to be resolved, and may seem impossible, yet the Industry of an Ingenious Geometrician makes it possible and that most facil, sundry ways. For in

in the first place if you make a Circle upon a fine Plain, and upon the Center of that Circle a small Peg of Wood be placed, to be raifed up and put down at pleasure by help of a small hole made in the Center, then with the fame opening of the Compasses you may describe Circles Concentrical for the higher the Center is lifted up, the leffer the Circle will be Secondly, the Compass being at that extent upon a gibbous Body, a Circle may be Described which will be less than the former upon a Plain and more Artificially upon a Globe or round Bowl: And this again is obvious upon a round Pyramid placing the Compasses upon the Top of it which will be far less than any of the former and this is Demonstrated by the Twentieth Proposition of the first of Euclid.

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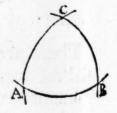
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To make or describe an Oval Form, or that which near resembles unto it, at one turning with a pair of Common Compasses.

There are many ways in Geometrical Practices to make an Oval Figure, or one near unto it, by several Centers, but that it may be done promptly upon one Center only, appears when one defcribeth Circles with the points of a common Compass somewhat deep upon a Skin stretched forth hard: which contracting it felf in some parts of the Skin maketh an Oval form. But it will more evidently appear upon a Column or Cylinder: if Paper be placed upon it, and then with a pair of Compasses describe as it were a Circle upon it, which Paper afterwards being extended will not be Circular but Ovalwise. But Henry Van Etten's Mathematical Recreations tells of a pair of Compasses having one foot lower than the other, and made to go with a Spring betwixt his Legs, by which guiding a Thread an Oval may be described upon a plain.

To make a Triangle that shall have three Right Angles.

Open the Compasses at pleasure and upon A. describe an Ark BC, then at the same opening place one of the feet in B and describe the Ark A C. Laftly place one of the feet of the Compasses in C and describe



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the Ark A B so shall you have the Spherical Æquilateral Triangle A B C right Angled at A, at B and at C, that is each Angle comprehends 90 Degrees which can never be in any plain Triangle.

How to draw a Parallel Spherical Line with great ease.

First draw an obscure Line GF in the middle of it make two

Points A B (which ferve for Centers) then place one foot of the Compass in B, and extend the other footto A, and describe a Semi-circle, then place one foot of the Compasses in A and extend the other

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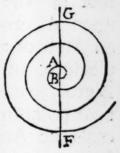
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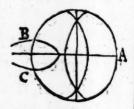
drawn, and describe another Semicircle; Then place the Compasses in B and extend the other foot to the end of the Circular Line drawn, and describe thereto another Semi-circle and so ad infinitum, which being neatly done that there be no Right Line seen nor where the Compasses were placed, will seem very strange how it could possibly be drawn with such

Geometry.

fuch exactness, to those who are Ignorant of the way whereby it is done.

How to describe a Circle that shall touch three Points placed how soever upon a Plain, if they be not in a Right Line.

Suppose the three points be ABC, put one foot of the Compass upon A, and describe an Arch of a Circle at pleasure, and placed at B cross that Arch in the



two points E and F, and placed in C cross the Arch in G and H, then lay a Ruler upon G H, and draw a Line, and place a Ruler upon E and F, cut the other Line in K, so K is the Center of the Circumference of a Circle which will pass by the said three points A B C. Or it may be inverted, having a Circle drawn to find the Centre of that Circle; make three points in the Circumference, and then use the same way, so shall you have the Center.

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How to change a Circle into an exact square form.

Make a Circle, as the Circle ABCD

E, of which A is the Center, then cut it into four Quarters, and dispose them so, that A at the Center of the Circle may always be at the Angle of the square and so the four Quarters of the Circle being placed so, it will make a perfect square, whose side A is equal to the Dia-

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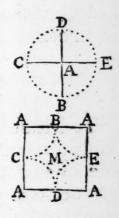
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meter BD. Here is to be noted that the square is greater than the vacuity in the Middle, viz. M.

And now I shall proceed to the more necessary and beneficial part of this Science, inserting a Collection of the most practical and useful Propositions I can find both of advantage and pleasure, And first of

The Mensuration of Land.

A Pole or Perch is 16 Foot and a half, and four Poles in Breadth and fourty in Length make an Acre, so that an Acre is 160 Poles.

Squares.

To Measure a Square piece of Land Multiply one of the sides by the other side joyning to it, and Divide the Sum by 160. As for Example, A piece of Land being 40 Poles one way, and 20 Poles another way, these Multiplyed make 800 Poles, which divided by 160 shews five Acres for the Contents, or else as 160 to the one side 40 Poles, so the other side 20 Poles to the Content in Acres, 5 Acres.

Triangles.

Measure the longest side of the Triangle, and the Perpendicular from the Angle opposed to that long side, and then Multiply the half of the one by the whole of other and divide by 160, as Let

Let the side be 60, the Perpendicular 40, 60 Multiplyed by 20, or 40 by 30 makes 1200, which divided by 160 yield 7 Acres and an half for the Contents.

Trapezia or Double Triangle.

Multiply both the Perpendiculars by half the Diagonal Line which is the Common Base of both the Triangles and Divide by 160. As let the Diagonal Line be 40, one of the Perpendiculars 15 the other 8, these two added togegether make 23, which Multiplyed by half the Diagonal Line 20 makes 1460, which divided by 160 makes 2 Acres, 3 Roods 20 Poles. Or essentiations

As 320 to the Sum of the two Perpendiculars 23, fo the length of the Diago-

nal Line 40 to the Content.

Circles.

Multiply half the Diameter by half the Circumference and Divide the Product by 160. So the Diameter of the Circle being 140 Poles, and the Circumference 440 Poles, the half of these two being

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being 220, and 70 multiplyed together, produce 15400 Poles, which divided by 160, yield 96 Acres and a Quarter.

Ovalls.

Let the Oval be 30 Poles one way and 40 Poles the other, what is the Content? Multiply the length 40 by the breadth 30 it makes 1200, which Divide by 203 10, it yields 5 Acres, 3 Roods, 23 Perches.

Irregular Figures.

If the Figure which you are to meafure confifts of many unequal Sides and Angles, you must first reduce the same Figureinto several Triangles, by Drawing of Diagonal Lines from Angle to Angle, and then by letting Perpendiculars fall from the Angles opposite to those Diagonal Lines you may Measure them as so many particular Triangles: the Contents of all which being added together, will be the Content of the whole Figure. And in the reducing of the Pregular Figures into Triangles this Note will be worth observing. The Number of Triangles into which any Irregular Plat or Figure

Figure may be reduced will be less by two than the Number of the sides of the Irregular Figure.

The Mensuration of Timber.

Square.

The usual way is to have a Line upon their Ruler to shew how many Inches make a foot for any square. But it is as good a way or better (especially if you cast it up with your Pen) to know how much one Foot length of any square will yield in proportion to a Foot of Timber which is to contain 1728 Cubick Inches, which you may do by this Rule.

The Answer will be o, 250 Now Multiply this by the Number of Feer in length, and it yields the Content of the piece of Timber in Feet and parts. As if this piece of Timber

6 Inches square were 10 Foot long, it would contain 2 Foot 500 paces or an half.

Round.

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Because there is so much abuse in the Measuring of Round Timber, observe this more plain and ready way for Measuring thereof which is thus. Take the Compass thereof with a String, and then measuring the String by your Ruler, fee how many Inches the Tree is in Compass, and then find those Inches in the following Table, and there you shall see how many Inches and parts of that Tree will make a Foot of Timber which take out with your Compasses and turn them over from one end to the other of the Tree, and the feveral fpaces will shew how many Feet of Timber is in that Tree, thus,

Let the Compass of a Tree be sixty Inches you shall find in the following Table against sixty Inches Compass, that six Inches 3 parts of an Inch divided into one hundred parts make a foot of Timber; so that if the piece of Timber be twelve foot long, there is very near twenty four foot of Timber

in it, for twelve foot and one Inch is fomewhat more than twenty four foot.

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er in If the Tree exceed the Compass of one hundred Inches (which is the greatest Number in the Table) then take half the Compass and find the Number in the Table belonging thereunto, and divide it by 5 that is take a Quarter of that Number, and so many Inches and parts will make a foot of Timber of a Tree of that Compass.

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A Table for Measuring Round Timber.

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Of any form if strait and equal.

Cast up the Superficial Content at the end thereof and find how many Inches it contains by the Geometrical Propositions before for the finding out the Content of the Triangle, Long Square, Many Square, Round Circle, and then say, as 144 the Inches of the Superficial Content of the end or side of a Cubique foot to a Cubick foot containing 1000 parts, so the Superficial Content of the end of any piece of Timber let it be 100, 200, 300, Inches, to the solid Content of one foot length thereof.

Tapering Timber Cones or Pyramids.

Many times Timber is less at one end than the other and most Trees or Round Timber is so. Now the common way to measure such a piece of Timber is to Measure it by the Square or Compass taken in the middle thereof, but that gives the Quantity a good deal too little, and the more Tapering it is so much the worse.

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These pieces of Tapering Timber are either parts of Cones or Pyramids, now the way to measure a whole Cone or Pyramid is to Multiply the Superficial Content of the Base by a third part of the length. And the best and plainest way to measure these Sections will be first to find the length of the Pyramid or Cone, and so to find the Content thereof, then by the Superficial Content at the lesser end, and the length which belongs to that part, find the Content thereof as if it were a Cone or Pyramid it felf. Laftly Substract the Content of this leffer top-part from the Content of the whole, the Remainder must needs be the Content of the bigger bottom part which you were to Measure.

Now to find the length of the top part of the Cone or Pyramid which is cut off, Measure the Sides or Diameters of the 2 ends, and observe how much they differ from each other in Breadth. Then, as the difference of the breadth of the two ends, To the length between them: So the breadth of the Greater end to the whole length of the Cone

or Pyramid.

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Or if this may feem difficult and tedious, you may part your piece of Timber into feveral parts 10 or 5 foot long, and fo measure each part according to his Square or Compass in the middle, and then add them all together. This will come very near, and you will find much difference between this, and measuring the whole piece at once by the middle.

The Mensuration of Superficies,

As Boards, Glass, Pavements,

May be Effected Arithmetically or Instrumentally, but the Arithmetical being! most certain, I shall only make use of that as best, and in order thereunto first shew how cross Multiplication, or Multiplication of Feet and Inches by Feet and Inches is to be performed; which is thus.

If it be required to Multiply 9 Foot 3 Inches by 7 foot 6 Inches, fet down the Numbers to be Multiplyed one under another with a cross between them, as you fee in the Margent; and drawing a Line under them begin your Multiplication in this manner. First Multi-

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7 63	6
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69	4 1/2

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ply Feet by Feet, saying 7 times 9 is 63 Feet, set 63 under the Line in the place of Feet. Secondly Multiply as the Cross directs you, faying, 9 times 6 is 54 Inches which is 4 Feet and 6 Inches, set the the 4 Feet under Feet, and the fix Inches Thirdly Multiply cross under Inches. again, faying 7 times 3 is 21 Inches, that is I Foot 9 Inches, fet the one Foot under Feet, and the 9 Inches under Inches. Fourthly, Multiply Inches by Inches, faying 3 times 6 is 18, that is 12 of an Inch, which is I Inch and a \frac{1}{2} or 1\frac{5}{2}, which fet under Inches, Lastly draw a Line and add all together, and you shall find the Sum to be 69 Feet 4 2 Inches.

But

But before any of these can be Measured it will be likewise necessary to know how to measure any plain superficial Figure, as a square, long square, Triangle, Circle parts of a Circle, oc.

The Square.

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Let there be a square Floor or Pavement the 42 fides whereof are each of them 42 Feet and 6 42 Inches, and it is requi-84 red to know how ma-168 ny square or superficial 1764 feet is contained therein 2 I Multiply 42 Feet 6 21 Inches (as you see in the Margent) and the Pro-1806 duct will be 1806 Feet and 3 Inches or 1 Quarter of a Foot, and fo many Superficial Feet doth that Floor or Pavement contain.

The Parallelogram or Long Square.

In a Pavement whose length is 72
Feet and breadth 12, how many Feet is contained therein. Multiply 72 Feet
U 4 by

by 12, it will be 864, and so many are the superficial Feet.

Triangle.

All right Lined Triangles (of what kind foever) may be measured thus. Multiply half the length of the Base by the length of the Perpendicular. Or half the length of the Perpendicular Multiplyed by the whole length of the Base, the Product of either shall give the Superficial Content of the Triangle.

A Trapezia,

Or Figure whose Angles are not right nor sides equal, as the Figure in the Margent. Draw a Diagonal Line from A to D, and from the Angles B C draw Perpendicular Lines to the Diagonal Line A D. Then Measure the Diagonal Line A D. Then Measure the Diagonal Line A D, and here suppose it to be 46 Foot 6 Inches, and one of the Perpendiculars 9 Foot 10 Inches, and the other 12 Foot 4 Inches,

A C 46	$ \begin{array}{c} B \\ D \\ 6 \end{array} $
46	<u></u>
506	
5	6
3	012
515	4 th

these two added tegether make 22 Foot 2 Inches, the half whereof is 11 Foot 1 Inch, which being Multiplyed by 46 Foot 6 Inches, the length of the Diagonal Line A D, the Product will be 515 Foot 4 Inches and ½ of an Inch for the Content of the Figure A B C D.

Circle.

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The Diameter of every Circle hath fuch Proportion to the Circumference of the same Circle as 7 hath to 22, from whence may be performed the following necessary and useful Conclusions.

1. The Diameter of a Circle being given to find the Circumference. Let the Diameter of the given Circle be 14, Multitiply the Diameter 14 by 22, the Product will be 308, which divided by 7, the Quotient is 44, and so much is the Circumference of that Circle whose Diameter is 14.

2. The Circumference of a Circle gi-

ven, to find the Diameter.

Let the Circumference of a Circle be 44, Multiply 44 by 7, the Product will be 308 which Divide by 22 and the Quotient will be 14, and so much will the the Diameter of a Circle be whose Circumference is 44.

3. The Diameter of a Circle being given, to find the Area or Superficial Content of that Circle.

Let the Diameter of the given Circle be 14, Multiply 14 by 14, the Product will be 196, this 196 Multiplyed by 11 produceth 2156 and this Number divided by 14 giveth in the Quotient 154 for the Area or Superficial Content of the Circle.

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A Semicircle.

Multiply half the Diameter which is 7 by a quarter of the Circle.

A Quadrant.

Or quarter of a Circle. Multiply half the Diameter which is 7 by the eighth part of the Circle.

The Mensuration of Solids.

As Plain or Superficial Measure confisteth of two Dimensions, namely Length and Breadth, so solid measure consists consists of three Dimensions, viz. Length, Breadth and Thickness.

A Cube

Is a folid Body confifting of 6 fquare Plains whose sides and Angles are all equal as a Dye. Suppose a piece of Stone or Timber to be in such a form, that every side thereof were two soot 9 Inches long, how many folid Feet of Stone or Timber is there in such a Cube. First Multiply 2 Foot 9

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Inches the fide in it felf (which is 2 Feet 9 Inches) by 2 Foot 9 Inches and the Product will be 7 Foot 6 Inches and 3 of an Inch, and is the Area or Superficial Content of one of the Flat fides.

And this Product Multiplyed again by the fide 2 Foot 9 Inches produceth 20 Foot 9 Inches 2 of an Inch, and fo much folid Stone or Timber is contained in that Cubical piece.

A Parallelopipedon or long Cube.

If there be a long squared piece of Stone or Timber (or other solid matter) whose length	18
is 142 Inches, its breadth 18	13
Inches and depth 13 Inches,	.24
how many folid Feet is contain-	54
ed therein?	234
First Multiply the breadth	142
18 by the depth 13, the Product	468
is 234 for the Superficial Inches	936
at the end of the piece.	234
	33228
by 142 the length of the piece	,
	Inches
for the folid Content.	LITCHES
Thirdly Divide 33228 by	
0 1 0 1 1 1 1 1 1 1 1	
191011011	
101111111111111111111111111111111111111	(6
quarter of a root wanting	(19
30 Inches. And to much is	88
the folid Content of that	
piece.	

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A Prism or long Triangle.

If the Base of the Triangle
of the and of the piece he so
7001011 016 0 h9 0 0 0 0 11001100 12 2 0 0 0 0 7 2
Inches, the Perpendicular 21 16
Inches, and the length 108
Inches and les the folid Content
thought he manufact
This triuliply to the hands
the Bale by 21the Perpendicular
and the Product will be 226 2000
for the Area of the Triangle. 3360
occolidity, ividitiply 330 by
108 the length of the piece and
the Product will be 36288 for the solid
Inches in the whole piece.
Thirdly Divide 36288 by 27
1/20 the Subtlent win be
so that there is just 21 Feet 27288
in this folid piece.
TOTA Proof.

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Irregular Solids.

Prepare a hollow Cube into which put your Irregular Body which being placed therein, pour therein Water till it no more than cover the Cube, then make a Mark in the infide of the Cube where

where the Superficies of the Water toucheth, this done take out the Irregular Body, and mark again directly under the former where the brim of the Water now toucheth, for the distance of these two marks multiplyed by the square of the Cubes side produceth the Crassitude of that Irregular Body.

And now referring to the Authors at large for the Mensuration of other Figures Superficial and Solid, I shall for the greater ease in Measuring add some Tables of Board and Timber Measure

ready Calculated.

A Table

A Table shewing the length of a Foot Square in Board, Glass, Pavement, &c.

Inches.		Feet.Inch. Parts.			Inches.		Feet.Inch. Par.		
	1	12	0	0		19	0	7	6
7	2	6	0	0		20	0		2
	3	4	0	0	.:	21	0	7	8
The Breadth of the Board, Gc.	4	3	0	0 80 60	É	22	0	6	
•	5	2	4	8	-30	23	0	6	5 2 0 8
He		2	4 0 8 6	0	ard	24	0	6	0
Š	8	I	8	6	g	25	0	5	8
e E	8	I	6	0	<u>0</u>	26	0	5	
5	9	I	4	0	+	27	0	5	3
ö	10	I	2	4	of	28		.5	I
금	11	1	1	1	th.	25 26 27 28 29 30	0	5	0
ad	12	I	0	0	ad	30	0	4	8
34	13	0	II	9	3re	31	0	4	7
2	14	0	10	9 3 6	e E	32	0	4	5
F	15	0	9	6	The Breadth of the Board, &c.	33	0	4	4
	16	10	9	0	3	34		4	531087542
	17	0	8	5	5 5	35	0	4	I
	18	0	8	0		36		4	0

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A Table for Measuring square Timber or Stone.

Square Inches.		foli	d Foot neh. Pa	in	Square Inches		The length of a folid Foot in Feet.Inch.Par		
	6	4	0	0	C C	22	0	3	5
	7	2	II.	2	0	23	0	3	3
	7 8	2	3	0	0	24	0	. 3	0
43	9	I	9	3	4	25	. 0	2	8
ğ	10	. 1	5	3	fide.	26	0	2	6
e	11	I	2	3	2	27		2	3
The length of the fide.	12	1	. 0	0	of the	28	10	2	2
40	13	0	10	8	0	29	0	2	I
去	14	0	8	8	長	30	. 0	1	9
50		0	7	6	gu	31	. 0	1	8
0	15	0	6	7	1	32	0	1	7
Pe	17	0	5		The length	33	0	1	6
H	18	0	5	9 38	1	34	0	I	5
	19	0	4	8		35	0	1	4
	20	0	4	3		36	0	1	3
	21	0	. 3	9		.	1-	1	

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ber of a And now I shall set down some Rules for

The Mensuration of Artificers Work.

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Carpenters for the most part Measure their Work by the square which is 10 Foot every way, and 100 in all, they agree so for their Flooring, Partitioning Raftering, and have several prices for every sort of Work. For Stair Cases they either agree by the whole, or by the Step, for their Windows they agree for so much a Light.

Bricklayers for the most part agree and measure by the Rod, which is sixteen Foot and a half square every way, and 272 Foot in all. They generally, that is to say many of them demand about 7 l. a Rod, and to find all Materials, or fourty Shillings a Rod and the Builder to find them. Note, they reduce all their work to one Brickand a half, and so measure the same, and 4500 Bricks will make a Rod of Brickwork.

Foot high, Multiply 192 the length by 12 the heighth, the Product will be 2204, which divided by 272 (the Number of square Feet upon the Superficies of a Rod) the Product in the Quotient is 8 Rod and 26 Foot. But because

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there

there is a difference, all Brickworks being not of equal thickness, the Standard for Brickwork being the thickness of one Brick and half; if the Wall be thicker or not so thick, it may be reduced to that Standard by this General Rule. Multiply the Number of Superficial Feet contained in the Wall by the Number of half Bricks, which that Wall is in Thickness. One third part of that Product shall be the Content of the Brickwork reduced to the Standard of one Brick and half.

For Tyling they commonly measure it by the square of 10 Foot as the Carpenters do, so that in a Roof, the Carpenters work in measure will be very little, but the Bricklayers will be most; besides, the Lricklayers sometimes will desire to have running measure for Hyps and Valleys, which in some cases may be allowed, but in most not. They demand very largely for this fort of Work, some demanding 40 Shillings a square, and a square of Tyling takes up about 700 Tyles, which are fold at about five and twenty Shillings a Thousand. For Chimney work and other work of these Artificers I refer to Authors at large.

Plaisterers Work is principally of two kinds, namely, 1. Work Lathed and

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Plaistered which they call Cieling. 2. Work rendered which is of two kinds, wiz. either upon Brickwork, or in Pactitioning between the Quarters. All which they measure by the Yard square, or the square of 3 Foot, which is 9 Foot. Every hundred of Laths (which costs about 20 pence) will cover 6 Yards of Cieling or Plaistering. For Lathing and Plaistering against Cielings and Partitions they ask about ten pence a Yard, and for Partition Walls one Shilling.

If a Cieling be 58 Foot 9 Inches long, and 23 Foot 7 Inches broad, how many Yards is contained therein? Multiply 58 Foot 9 Inches by 23 Foot 7 Inches, the Product will be 1385 Foot 6. Inches: the 6 Inches and ½ reject, and divide 1385 by 9, the Quotient is 153 Yards, and 8 remaining, which is 8 Foot, fo that that Cieling contains 153 Yards 8 Foot, or

or 154 Yards wanting 1 Foot.

If a Partition or Partitions between Rooms be 132 Foot about and 12 Foot high, how many Yards is contained therein? Multiply 132 by 12 the Product is 1584 which divided by 9 giveth in the Quotient 176, and so many Yards is contained in that Partitioning. Note,

X 2

1. If there be any Doors or Windows in your Partitioning, you must make Deduction for them. 2. When you measure rendering upon Brickwork, you must account of all you measure, without Deducting; but when you measure rendring between quarters, you may deduct one fifth part for the quarters, braces and entertoises.

Whiting and Colouring are measured

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as Cieling and Partitioning are.

Joyners Measureall their Work by the Yard or Square of 3 Foot, which is 9 Foot, as the Plaisterers do, but in taking of their Dimensions they differ; for Joyners fay, We ought to be paid where our Plain goes, wherefore in taking of the heighth of any Room, where is a Cornice above, and fwelling Pannels and Mouldings downwards, you must with a Line girt over every Member of the Cornice, and swellings of the Mouldings which in lufty work will make the Room much higher than it is. For Measuring about the Room, some Joyners are so unreasonable that they desire a Girt that way also; but that makes an unreasonable Augmentation which ought not to In Window Shuts, Cupboard doors and

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and fuch things as are wrought on both fides, they account to be paid for work and half work, for indeed the work is half more though the stuff be the same.

If a Room of Wainscot being girt, do contain in heighth 15 Foot 7 Inches and be in Compassabout 286 Foot, how many yards doth that Room contain? Multiply 286 by 15 Foot 7 Inches, the Product will be 4456 Foot 8 Inches, which divided by 9 (the 8 Inches omitted) and the Quotient will be 495 Yards and 1 Foot, and so many Yards is contained in that Room.

Let the Window Shutters about a Room (all of them together) be 78 Foot 4 Inches, and let the height of them be 6 Foot 6 Inches, how many yards is contained in these Shutters at work and half? Multiply 78 Foot 4 Inches by 6 Foot 6 Inches, the Product will be 509 Foot 2 Inches, the half whereof is 254 Foot 7 Inches, which added together make 763 Foot 9 Inches, or 764, Foot which being divided by 9 the Quotient will be 84 Yards and 8 Foot. And

so many Yards are contained in those

Shutters, counting work and half work.

Note

Note that you Deduct for all Window dow lights, and measure the Window Boards, Cheeks and Sphetaes by themselves.

Painters take the Dimensions of their work the same way as the Joyners by girting of the Moldings, and the Dimensions being taken, the casting up and reducing Feet into Yards is the same with Plaistering or Joynery, but the Painter never accounts work and half, but once,

twice, or thrice done over.

Glaziers Measure by the Foot square, so that the length and breadth being Multiplyed together produceth the Content of any pain of Glass. When Windows have half rounds at the top, they measure them at the full height as if they were Square, Ovalor Round Windows they measure at the full Lengths and Breadths of their Diameters. Crooked Windows in Stone Work are all measured by their full squares, there being more trouble and more wast of Glass.

If a Pane of Glass be Foot 49 Inches long, and 3 Foot 2 Inches broad, to know how many Foot is contained therein, Multiply 4 Foot 9 Inches by 3 Foot

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2 Inches, the Product will be 15 Foot and half an Inch, and so many Feet are contained therein.

Masons Measure their work by the Foot either Superficial or Solid, wherefore the Rules delivered in the Mensuration of Superficials and Solids before, will perform any thing required in Mafonry.

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Smiths, Plummers and Carvers work being at so much a Pound or so much apiece, their prices alter as times change and occasions differ. And here it may not be amiss to set down the

Proportion of Metals.

A Cube or Bullet of a certain bigness of Metals or other heavy Bodies weigh thus.

1 Cubical	Pounds.	A Cubical	
Foot of	7 100	Foot of	Pounds.
Gold	1368	Marble	252
Silver	744	Irish Slate	156
Lead		Salt	1172
Copper	648	Honey	1045
Ruickfilver	9777		6811
ron		Oyl	66
Tin .	5325	Wine	705
Earth	05	Water	72
land	132	Air weighs of an	Ounce ±
tone	140	Bricks	130
	V A		Navi-

Navigation

Having a great dependance upon Geometry as well as Aitronomy, and being a Mathematical Art, although professed by rude and unskilful Men, yet most perfect and Ingenious Seamen have good skill in the Liberal Arts, and therefore shall we speak somewhat thereof here and then proceed to the Gauging of Ships and Vessels.

Navigation is commonly diftinguished into three forts, Plain Sailing, Mercators way, and Circular Sailing or Sailing

by the Arch of a great Circle.

Plain Sailing or Sailing by the Plain Chart, sthe plainest and Foundation of all the rest; and near the Æquinoctial there is need of no other to be used, because there the Degrees of Longitude, as well as of Latitude are all equal, each Degree being divided into 60 Minutes or Miles, though they are somewhat more than English Miles, each Minute or Mile containing about 6000 Feet, in this Art the Seaman hath these helps. First he hath his Compass to direct him which way he goes, which is divided first into sour Cardinal Points or Quarters, East West.

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West, North, South, and each of these Quarters are divided into eight equal parts, commonly called Rhombs making in all 32 Points. So that steering by the Compass well made and duly rectified, the Seaman always knows which way he fails to a very small matter. The fecond help the Seaman hath in keeping his Account, is, a careful observation (by the Log line or some other good way) how many Miles or Leagues he fails every hour, and so every Watch and to every Day. The third help is the knowledge and observation of the Latitude both of the Place from whence he fails, and where he is arrived, or whither he is to fail. And out of these three things the Doctrine of plain Triangles he comes toknow all that is necessary for the keeping of his Account: So that he may know at any time where he is, how far he hath failed and how far he is yet to fail, and which way, or upon what point of the Compass he is to steer, and all this by the plain Rules of Rectangular Triangles. For which having no prefent occasion I refer to the Authors who treat thereof at large.

Sailing

Sailing by Mercator's Chart requiring Tables of Meridional Parts or Miles and other things, I shall refer you to Phillips's Mathematical Manual, Blun-

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devil's Exercises and many others.

Circular Sailing or Sailing by the Arch of a great Circle is difficult, and of little use altho' in some sence it is the most exact way of Sailing. For Seamen do seldom keep their course near this Arch, but are either drawn aside from it, by some conveniencies of Winds and Streams, or essearce forced away by crosswinds or Interposition of some head Lands or Islands. See Mr. Phillips's Geometrical Seaman.

Gauging of Ships.

Proposition 1.

ToGauge aship and cast up how many Tuns her Burthen is, Measure the length of her Keel, the breadth at the Midship Beam, and the depth of the Hold, and Multiply these three one by the other, and divide the Product thereof by 100 so you shall find how many Tuns her Burthen is. But for Merchants Ships who give no allowance for Ordnance, Masts,

Masts, Sails, Cables, Anchors, which are all a Burthen but no Tunnage you must divide your Product by 95, so the aforesaid ship will be found to be 105 Tuns 35 parts. But this way of reckoning the Tunnage of Ships, though it may come near in some Ships, yet it may miss much in others, for all Ships are not built of the same Therefore it is the best and truest way to cast up the Content of the Ship more exactly according to the Rules of Art, with respect had to the Mold and Shape of the Ship, and so to find how many Cubick Feet the Ship doth contain, and every Cubick Foot of Water according to some weighs 55 Pound Averdupois. But Dr. Wybard found every Cubick foot of Water to weigh 62 Pounds 588 parts. Now every Tun being 20 Hundred weight, and every 100 weight 112 Pound which makes 2240 Pound, divide this by 62 Pound 588 parts, it makes 35 Foot 79 parts. So that about 36 Cubick Feet make a Tun weight.

But here take notice, if you thus meafure a Ship within, you shall find the Content or Burthen the Ship will hold or take in. If you measure the Ship on the outside to her Light Mark, as she swims being unladen, you shall have the weight or Content of the Empty Ship, and if you measure from this light mark to her full Draught of Water being laden, that will be the true Burthen or Tunnage of the Ship.

Propos. 2.

To make a Ship Double or Treble or in any Proportion to another Ship. Multiply the Measures of the length, breadth or depth of a Ship Cubically, and then double or treble the Cube and extract the Cube Root of each and it will be the Cubical Root of Breadth, Length and Depth respectively.

Gauging of Vessels.

There are two things necessary herein. First to reduce Vessels to a Regular Proportion. Secondly to find the true quantity of the Gallon in Cubick Inches or parts of a Foot, both which are much controverted.

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For the first of these one of the best ways is that of Mr. Oughtred. Measure the Diameter of the Cask, both at the Bung and at the Head, and by their Diameters find out the Area of their Circles. Then take two thirds of the Area at the Bung, and one third of the Area at the Head and add them together, this will be the mean Area of the Vessel. Lastly if you Multiply this mean Area by the length of the Vessel, it will shew how many folid Inches the Veffel contains, which if you divide by the Number of folid Inches in one Gallon, it will fhew you how many Gallons the Cask will hold.

Suppose a Wine Cask, having the Diameter at the Head 18 Inches, and the Diameter at the Bung 32 Inches, and the length 40 Inches, what is the Content?

of the Area at the Head is	84, 823
of the Area at the Bung is	536, 166
	620, 989
The Sum of these two Multiplyed by the length	40
Makes Solid Inches	34839, 560

Which divided by the folid Inches in oneGallon of Wine, which are 231 Inches, yields

yields for the Content 107 Gallons 5309 that is somewhat above half a Gallon.

But now here is the fecond difficulty, to resolve how many solid Inches are in

a Gallon.

As for the Wine Gallon it hath been and still is commonly received, that a Wine Gallon contains 231 Cubick Inches yet Dr. Wybard says it is somewhat less, viz. 224 or 225 at most. But this difference is not so much as others make it in the Ale Gallon, for tho' most old Gaugers and the Coopers make the Ale Gallon to the Wine Gallon, as 4 to 5, so that the Wine Gallon being 231 Inc. the Ale Gallon is 288 Inches 4, yet since the Excise it is accounted by them but 282 Cubick Inches.

To Gauge a Cask which is not full. First Measure the Diameters of the Cask at the Head and Bung and so find the Content of the whole Cask. Then Measure many how Inches deep the Liquor is which is in the Cask, and then work by the Rule of Proportion.

Let the Cask be as before 32 Inches at the Bung and the Liquor 24 Inches

deep.

As the Diameter at the Bung in Inches	
To the Depth of the Liquor in Inches	24
So the Radius of the Table	10000
To the part proportional	7500

Find this Number 7500 in the Table following, and it answers very near to 50 Gallons 3 Quarters.

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A Table

A Table for Gauging Wine Casks not full.

G.	Parts	G.	Parts.	j,	Parts	G.	Parts	G.	Parts	. J G.	Parts.
2	295	ìi	2328	00	377	732	\$057		635	3 5 3	7829
1	470		2405	22	384		5115	43	641	3	7909
	602	12	2481		3900	33	5174		648	3 5 4	7990
2	720		2556	23	3960	•	5234	44	654	3	8072
	830	13	2630		4024	134	5294		661	5 5	8154
3	935		2703	24	4087	7.	5354	45	6679	7	8236
	1038	14	2775 2847 2918 2986		4150	35	5415		6749	156	8319
4	1138		2847	25	4213		5476	46	6811		8404
	1235	15	2918		4276	36	5535		6877	57	8491
5	1339		2986	20	4338		5600	47	6944		8580
	1420	10	13056		4400	37	5002		7012	15 0	9001
			3123								
	1596	17	3189		4542	38	5787		7153	59	8862
7	1681		3255	28'	4585	1	5850	49	7225		8962
	1764	18	3321	1.	4646	39	5913		7297	60	9065
			3387								
	1928	19	3452	1	4766	40	6040	1	7444	61	9280
9	2010		3517	30	4826		6094	51	7519		9398
	2091	20	3582	1	4885	41	6158	1	1595	62	7530
LO	2171	1	3647	31	4943		6223	527	672	. 19	7705
	2242	21	3712		000	42	6288	1:	7758	621	0000

And now work again thus, omitting the smaller Fractions which are of little Concernment.

	Gal.	Par.
As the Gallon of the Radius?	63	00
To the Proportional Gallons found	50	75
So the Content of the whole Cask	107	50
To the Content of the Liquor being	24 Inches 86	61
	•	Lat

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That is somewhat above 86 Gallons and an half.

To Measure Tuns whether Square, Round or of what form soever.

First find the Content of such Tuns in solid or Cubick Inches, by the former Rules of Measuring such Bodies; which dividing by 282 the Inches in one Gallon shews the Content in Gallons, and dividing the Gallons by 36 (the Gallons in one Barrel) shews the Content in Barrels. Note, one Foot square is near half a Gallon, for there is 144 Inches in a Foot which doubled makes 288 which should be the Content of the Ale Gallon, the here it is a little lessened to 282 laches.

All Engines of War both for Land and Sea Service being by the benefit of Geometry I shall proceed to speak somewhat of

Gunnery.

The Names of the principal Members of a piece of Ordnance.

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The outfide round about the piece is talled, the Superficies of her Metal; the Y Substance

Substance or whole Mass of Metal, the Body; the Hollowness or Concave Cylinder, the Bore or Soul; fo much of her Bore as containeth the Pouder and Shot, is the Chamber or Charged Cylinder ; the Remainder her vacant Cylinder; the Spindals or Ears are called the Trunnions; the Pummel at her Coyl, the Cafacabell Deck; the little Hole the touch Hole; all the Metal behind the touch Hole her Breech or Coyl; the greatest ring at her touch Hole, her base ring, the next ring above her touch Hole her Reinforc'd Ring; the next to that her Trunnion Ring, thering next her mouth the Muzzle ring; the ring between the Muzzle ring and Trunnion ring her Cornish ring; all the rings and circles about the Muzzle, the Frieze, the whole length, the Chace.

A Table

ner veral	Guns of length	a4 Inc	1 9 . 1	Bor Incl	E Inc	Sullets Diamet		Bullets.	d 8 Inc	Ladles Ladles Inch Bread.	Bread Inch	S Pour	Nonder Nonder		Shoots Level	Rand. Pace
Bafs. Ralinet.		nes. 1 0 0	inds.	arts.		arts.	inds.	nces.	hes. 4 4	arts.		. 0 .		ices, w n	2 100	2009
A Falcone. A falcon Minion ordinary.	0 11	000	7502	n n m	2 2 2 2		3 2 2	4	~ ∞ 4 ~ ∞ ∞	444	44~	0 4 0		4.4%	130	1300
Minion largest. Saker least. Saker ordinary. Saker old fort. Dimical ver least.	00000	00000	1800	w w w 4 4	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		W 40 L O		9 9 9 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	00400	20000	04040	w w 4 ~ ~	40004	150 150 160 163	1250 1500 1600 1630
Demiculver ord. Demiculverold f. Culvering leaft. Culvering ordin. Culvering largelt.	11172	00000	2700 3000 1000 1500	44000	44400		2 4 5 0 6 4 5 2 5 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		2 1 1 1 2 2 1 5 1 5 1 5 1 5 1 5 1 5 1 5	04400		04040	V 8 0 1 1	400000	175 178 180 181	175c 178c 180c 181c
Demican, leaft. Demican, ordin. Demican, large. Cannon Royal	2222	0000	\$400,6 \$600,6 \$000,8	8000	2000	L	0 2 6 3	0 0 00 00	0 0 0 0	0000	1221	4000	4 7 30 14	0 00 0 00	156	1560 1620 1800 1850

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Table

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There

There are three Degrees inused Fortiyingeach sort of Ordnance both Cannons and Culverings. First such as are ordinarily Fortifyed which are called Legitimate Pieces; secondly, such whose Fortification is lessened, which are called Bastard Pieces; thirdly, double Fortifyed Pieces or extraordinary Pieces. This Fortisication is reckoned by the thickness of the Metal at the touch hole, at the Trunnions at the Muzle in proportion to the Diameter of the Bore, for more particulars of which I refer you to the Authors that treat of Gunnery at large.

Of Pouder for Cannons 3 of the weight of the Iron Bullet for Proof, but for fervice half the weight of the Bullet is enough, especially for Iron Ordnance, which will not endure so much Powder as Brass Guns by one Quarter. For Culverings the whole weight of their Shot for Proof, and for Action 3. For the Saker and Faulcon 3 of the weight of their Shot, and for lesser pieces the whole weight may be used in service till they grow hot, but then you may abate with discretion. For proof of the lesser Pieces of all you may take once and 3 of the weight of their Bullet.

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Bullets must be somewhat less than the Bore of the Gun, that it may not stick and break the piece in the discharge. The most just and certain Proportion is to divide the Bore of the Gun into 20 equal parts, and let the Diameter of the Ball be 19 of these parts.

Ladles ought to be so proportioned for every Gun, that two Ladle fulls of

Pouder may charge the piece.

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To know how far any piece of Ordnance will shoot there is much difference, in Authors, but all agree in this. that the Bullet is carried from the mouth of the piece more violently, and for a good space in a streight Line or Range, but afterwards as it proceeds further, as the violent force of the Motion abateth, fo the Bullet finketh down by Degrees till it graze upon the Ground. Now these two Motions are considered apart, or else joyned together, but they are both of them somewhat the longer according as the piece is Mounted higher from the Level to the Angle of 45 Degrees, which is the utmost Random, and if you moth any Piece higher the Random of the dom of the Bullet will be shorter and shorter, so that if you could shoot exactly

ly upright, the Bullet would fall down

into the mouth of the piece again.

The right Range of every Piece being discharged in a Level or Parallel to the Horizon is set down in the forgoing Table, in which the Cannon exceeds not 185 Paces, that is 5 Foot to each Pace. Some reckon much more, but then they count ordinary Steps or Paces of 2 Foot and a half.

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ly

Batteries made with fuch Pieces are usually made at 100 or 120 such Paces, at which distance they do the best Ex-

ecution.

The utmost Random likewise of any piece, that is from the Platform to the first Graze of the Bullet, is found for the most part to be about ten times the distance of the right Range, and so is it set down in the Table.

Of Mortar-pieces.

As Cannons and other pieces of Ordnance are used for the most part to shoot forward near a Level, for Mortar-pieces are used for the most part to shoot upward, and at Random is Towns, or and therefore the Random of these pieces is very necessary to be known. And most 1

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most of the Tables found thereof agree in their Randoms tho' they are in a feveral Drefs, fo that one would think this were fully and certainly known, but yet there are several manifest Errors in the Tables of Randoms for which reason I shall omit some I have by me, and only place here one Table according to Mr. Norton's observations, inot lyable to fo much Absurdity, which Table I find thus stated in Mr. Philips's Mathematical Manual.

Boxes energy in Geometry.

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Toleson and the A Table

A Table of Randoms for Mortar-pieces according to Mr. Norton.

Deg.	Yards.	Diff.	Deg.	Yards.	Diff.	Deg.	Yards.	Diff
45	750	6	61	603	12	76	362	21
46	744	7	6z		12	77	341	21
47	. 737		63	\$ 578	distribution of	78	Suo 198	
48	Wopue 723	7	2 64	3 0.0	160 50 19	u 79	0 198	22
49	P 723	8	ntur 66	E 550		ntur 18	pue 175	2.5
49 50 51 52	2 715	8	0 67	1		100 82	2 25 I	2.4
52	£ 699	6 4 6	Mounture.	1 206	E 1	Mounture	9 227 9 202	
5 53	jo 690		₹ 6g			¥ 84		1
6 54	sp 680		Degrees 22 24 25 25 25	€ 474		8 85	¥ 149	27
54	E 670		50 71	E 457		Degrees	E 121	28
56	7 660	II	Q 72	439	18	87	u 92	
57	e 649	11	73	点 421	-	00	The 65	**
58	H 638		74	402		89	31	-
19		12	75	382	20	90	00	31
60	615						1. 1. 1.5	

For Dyaling see hereafter in Astronomy. And now for that infinite Causes may arise from Geometrical Figures which may deceive a Judge or Magistrate not skilled in Mathematical Demonstrations, I shall add these following

Experiments in Geometry,

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Problem 1.

Concerning two Neighbours changing of their Lands.

One Neighbour had a piece of Land four-square, each side 120 Perches, being round about 480 Perches, another would give him a square Field in Exchange, the fides whereof were longer than the others field, viz. 140 Perches, but the ends shorter, viz. 100 Perches apiece, which made a field of 480 Perches round also. Yet is the latter Field less by 400 Perches, viz. 2 Acres and an half. For Multiply 120 by 120 (the fides of the first Field,) and the Product is 1 4400, and so many square Perches doth that piece of Land contain. But Multiply 140 (the length of one of the longer fides of the latter Field) by 100 Perches (one of the shorter sides) and the Product will be but 14000, which discovers the loss.

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Problem 2.

Caius lent Sempronius a heap of Corn 20 Foot every way. Sempronius next year offers him 4 Heaps 12 Foot every way, or 7 Heaps 10 Foot every way, which seems extraordinary fair, yet would Caius thereby lose near 1000 Foot.

age, the fides whereat were longer in the orlors . Remides

Caius had a Field 24 Measures in Circuit being equally square, for which Sempronius gave him a Field of the same Circuit but a long square, viz. 9 Measures on two sides and 3 on the other, whereby he lost a fourth part. Caius brought his Suit at Law, whereupon Sempronius argued, that Figures that have equal Perimeter or Circuit (which equal Figures in Compass Geometricians call Isoperimeter) are equal amongst themselves which might have deceived a Judge ignorant in Geometrical proportions.

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Problem 4.

A Man having a Pipe of Water a Inch Diameter, for to make it more useful hath leave to make it so as to convey as much more Water, and therefore he goes and makes it 2 Inches Diameter, by this the Grantor is injured, for it will convey four times as much Water.

Problem 5.

A piece of Silver 20 Inches every way was borrowed, the Barty the next year having pieces of 12 Inches and 10 Inches every way, offers 4 of the greatest or 7 of the lesser, for that which he had of 20 Inches every way, which seems to be with advantage to the Lender, yet would he lose near 1000 Inches.

Problem 6.

Aristotle in his Mechanick Questions, faith the Merchants of his time used a deceitful balance, which had one Arm longer than another. As if the Beam were 23 Inches long, 12 should be on one

one side and 11 on the other, yet the short end was made as heavy as the longer, whereby it would hang in Æquilibrio, and putting in 12 Pound weight in the Balance hung upon the shorter part of the Beam, and 11 in the other, they would still hang even and seem just, tho abominable salse, cheating the Buyer of 1 Pound in 12.

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Problem 7.

A Country Fellow offers to serve a Farmer 8 years for one Grain of Corn and one quarter of an Inch of Land to sow it in the first year, and Land e-nough to sow that one Corn and the encrease of it for his whole 8 years, to which the Farmer agreeing, gave him above 420000 Acres of Land for his 8 years service.

Frohen 6.

doignate in his Mechanici. Questions, the the Merchans of his time used a criul balance, which had one Arm.

were as Inches long, is thould be on

Problem 8.

Gold and Silver or Lead of equal weeight put in light Boxes to know in which is the Gold.

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An Emperor to reward 'his Servant prepared two Boxes of like weight, Form and Magnitude, one containing. Gold the other Lead. Now if a Mathematician weigh these Chests first in the Air, and then in the Water it is clear by the Proportion of Metals, and according to the Principles of Archimedes, that the Gold should be less in his weight by his 18th part and the Lead by his 11th part, whereby it may be known in which the Gold is, but a more certain invention to discover this the Geometricians have and is thus, Take a broad pair of Compasses and clip one of the Chefts fomewhat from the middle, then fix a small piece of Iron in the Cheft between the feet of the passes, at the end of which hang a Weight, so that the other end may be counterpoiled and hang in Æquili-

brio. Now if the other Cheft being clipped in like distance from the end, and hanging at the other end the fame Weight there be found no difference, then clip them nearer the middle that fo the points of the Compass may be against some of the Metal inclosed or just against the extremity of the Gold, and suppose it hang thus in Æquilibrio it is certain that in the other Cheft is the Lead for the points of the Compasses being advanced as much as before which takes up a part of the Lead (because it occupies a greater place than the Gold) therefore that shall help the other weight and so will not hang in A. quilibrio.

Problem 9.

How many Weights will serve to weigh all things from 1 to 40 Pounds, and so unto 121 and 364. Answer 4 Weights or Numbers in Triple Proportion so as they be equal, or somewhat greater than 40, as 1, 3, 9, 27. As admit to weigh 21 Pound, put unto what is to be weighed the 9 Pound weight, and in the other Balance put the 27 Pound and 3 Pound, and so of others. To these 4 weights

335 weights add an 81 Pound weight, and you may weigh with them between I and 121 Pound. How to make a Pound of Water weigh as much as 10, 20, 30, or 100 nay 1000 pound of Lead, fee in Henry Van Ettens Mathematical Recreations, where you may read many fuch like performances in Geometry.

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ASTRONOMY.

Astronomia, ex despot & viu Astrorum Lex. The Science of the Magnitude and Motions of the Heavens and Stars, being comprehended under the Science of Cosmography which describeth the whole world, that is to say both the Heavens and the Earth, and since we cannot describe the one without mentioning the other, I shall divide the world into two Essential parts.

The Terrestrial or Elementary part containeth the Element of Fire, next to the Sphære of the Moon, and next below that is the Air, and next to that the Water, and the lowest is the Earth, of which see more in the beginning of the Treatise of Geography in my Gentles

mans Treasury.

The Celestial containeth Eleven Head vens or Sphæres, which in Ascending are 1. The Sphære of the Moon, 2. Mersury, 3. Venus, 4. Sol, 5. Mars, 6. Juniter

piter, 7. Saturn, 8. The Sphere of fixed Stars, commonly called the Firmament, 9. The Chrystalline Heaven, 10. called Primum Mobile, 11. called Calum Empyreum, the Imperial Heaven, where God

and his Angels are said to dwell.

The Magnitude of these Heavens is known by their Courses which those great Bodies within them make round the Poles of the Zodiack. The Moon runs thro' the Heavens by her natural course from West to East in 27 days 8 hours, Mercury in 88 days, Vonus in 225 days, Sol in 365 days and 6 hours, Mars in about 2 years, Jupiter in 12, and Saturnin 30; the eighth Heaven perfects its course according to the affirmation of Tycho Brahe in 25400 years. These Heavens are turned round about upon the Axis of the World by the tenth Heaven which is the Primum Mobile or first mover, by which Motion is caused Day and Night and the daily rifing and fetting of the Heavenly light, but before I proceed any farther it will be necessary to speak of the Ptolemaick, Co. pernican and Tychonick Systems of the World.

The Ptolemaick System is the most ancient, and by fome thought more confonant to the Letter of Scripture than the

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rest. It was first invented by one Claudius Ptolemaus a Native of Peleusium, who lived A.C. 135, and wrote several Books on this subject, placing the Globe of Earth and Water in the Centre of the World and supposed it destitute of all Motion. Next to the Earth the placed the Air with Vapours and Exhalations, which raising it self only a few Miles above the Earth is called the Atmosphere. Next to that he placed the Element of Fire, and in the spaces above, he ranked the Planets in the same order before rehearsed.

The Copernican System is the most generally received by the Astronomers and was contrived by one Nicholaus Copernicus a Physician of Thorne in Prussia, and Canon of Frassenburg, the Cathedral of Wamerlandt, who lived A. C. 1536, and framed a System or Hypothesis in imitation of the Pythagoreans who attributed a Motion to the Earth and placed the Sun as the foul in the Center of the World, and affigns the same place to the Earth, which Ptolemy allows the Sun, making the Earth a Planet having annual motion about the Sun which was fixed, and this opinion are all our Ablest Astronomers content with.

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The Tychonean System partakes of both the foregoing Systems, and was invented by one Tycho Brahe a Nobleman of Denmark Lord of Knudsthorp in the Isle Schonen. In his Hypothesis he supposeth that Mercury, Venus, and all the Planets, except the Moon, in their Motion respect the Sun as their Center, so that Saturn in opposition to the Sun, is nearer to the Earth than Venus in Apogao, and that Mars in opposition to the Sun is nearer to the Earth than the Sun it self. For the better understanding of these Systems, &c. I shall here give

A Description of the Material Sphare.

By the word Sphere we understand that common Instrument of a round Figure consisting of several Circles, invented to explain and represent the Heavenly Motions and the Fabrick of the whole World, which like a little Ball is in the Center of the Sphære having an Axis thro it, the extremities whereof are called Poles, about which the whole Body of the Heavens is supposed to turn round in the space of 24 Hours. But for more Explanation,

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The Poles of the World are two fixed Points in the Heavens Diametrically opposite to one another, the one visible in our Hemisphere, called the Artick Pole, the other not seen of us, being in the lower Hemisphere, called the South or Antartick Pole.

The Axis of the World is an imaginary Line drawn from Pole to Pole, about which the Diurnal Motion is performed from East to West.

The Meridians are great Circles concurring and interfecting one another in the Poles of the World.

The Equinoctial is a great Circle 90 degrees distant from the Poles of the World, cutting the Meridians at right Angles and dividing the World into two equal parts called the North and South Hemisphere.

The Zodiack is a Zone having eight degrees on either side of the Eclyptick, in which space the Planets make their Revolutions, divided into 12 Signs, having 30 Degrees to each sign, as Aries V, Taurus &, Gemini II, Cancer &, Leo A, Virgo W, which are called Northern Signs. Libra &, Scorpio II, Sagittarius 1, Capricornus v, Aquarius , and Pisces *, called the Southern Signs.

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The Eclyptick is a Circle in the midst of the Zodiack touching the Equinoctial in two opposite points of Aries and Libra.

The Colures are two Meridians dividing the Equinoctial and Eclyptick into two equal parts, one of these passes the Equinoctial points of Aries and Libra and is called the Equinoctial Colure; the other by Cancer and Capricorn, called the Solstitial Colure.

The Poles of the Eclyptick are two points 23 Deg. 30 Min. distant from the Poles

of the World.

The Tropicks are two small Circles parallel to the Equinoctial, and distant therefrom 23 Deg. 30 Min, limiting the Suns greatest Declination.

The Northern Tropick is called the Tropick of Cancer, the Southern the Tro-

pick of Capricors.

The Polar Circles are two small Circles, parallel to the Equinoctial, and are distant from the Pole of the World 23 Deg. 30 Min. that which is adjacent is called the Artick Circle and the Antartick Circle.

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The Zenith and Nadir are two points diametrically opposite. The Zenith is the Vertical point, or point right over our heads, and the Nadir directly opposite thereto.

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The Horizon is a great Circle, 90 Degrees distant from the Zenth and Nadir, dividing the World into two equal parts, the upper and visible Hemisphere, and the lower and Invisible.

Astronomical Definitions.

The Meridian of a place, is that which passeth by the Zenith and Nadir of the place.

Azimuths or Vertical Circles are great Circles of the Sphære, concurring and interfecting each other in the Zenith and Nadir.

Almicanters or Parallels of Latitude, are small Circles parallel to the Horizon imagined to pass thro every Degree and Minute of the Meridian between the Zenith and Horizon.

Parallels of Latitude or Declination are small Circles parallel to the Equinoctial, they are called Parallels of Declination, in respect of the Sun or Stars in the Hea-

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vens, and parallels of Latitude, in respect

of any place upon the Earth.

The Latitude of a place is the height of the Pole above the Horizon, or the differ ce between the Zenith and Equinoctial.

The Latitude of a Star is the Arch of a Circle contained between the Center of a Star and the Eclyptick Line making right Angles with the Eclyptick, and is counted either Nor hward or Southward according to the Situation of the Star.

Longitude on the Earth is measured by an Arch of the Equinoctial, contained between the Primary Meridian (or Meridian of that place where the Longitude is assigned to begin) and the Meridian of any other place, counted always Easterly.

The Longitude of a Star is that part of the Eclyptick, which is contained between the Stars place in the Eclyptick and the beginning of Aries, counting them according to the succession of the Signs.

Altitude of the Sun or Stars is the Arch of an Azimuth contained betwixt the Horizon and Center of the Sun or Star.

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Ascension is the rising of any Star, or any part of the Equinoctial above the Horizon.

Descension is the setting thereof.

Right Ascension is the Number of Degrees and Minutes of the Equinoctial (counted from the beginning of Aries) which cometh to the Meridian with the Sun or Stars, or with any portion of the Eclyptick.

Oblique Ascension is an Arch of the Equinoctial between the beginning of Aries and that part of the Equinoctial that riseth with the Center of a Star, or with any Portion of the Eclyptick in

an Oblique Sphære.

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Oblique Descension, is that part of the Equinoctial which setteth therewith.

Ascensional difference is an Arch of the Equinoctial being the difference between the Right and Oblique Assension.

The Amplitude of the Sun or Star is an Arch of the Horizon, intercepted between the rifing or letting of the Sun or Star, and the East to West point of the Horizon.

The

The Parallax is the difference between the true and apparent place of the Sun or Star.

Refraction is caused by the Atmosphere or vaporous thickness of the Air, near the Earths superficies whereby the Sun and Stars seem always to rise sooner, and set later, than in reality they do.

Of the two Hemispheres of the Heavens.

The one of these shews the Constellations of the Northern, and the other of the Southern Hemispheres of the Heavens: whereby may be seen the right Ascension and Declination of any of the Stars in either Hemisphere, by which any Star may be easily found, and the way or course of a New Star or Comet may be trac'd in its Way or Orbit with several other uses, &c.

Altho' (as David faith) the Number of the Stars is known only to God, yet Aftronomers by diligent observation have attained to the knowledge of many of them, as first they know the seven Planets otherwise called the Wandring Stars and have made manifest Demonstrations

strations of their Motions, and by continual observations have found out the manifold vertues.

Properties and Influences of the Planets.

Denotes in general Lands, Houses, Country Men, Ancient People, &c.

4 Signifies, Judges, Divines, Sena-

tors, Riches, Law, Religion, &c.

Signifies Souldiers, Physicians, War, Strife and Debate, Thest and all Cruelty, Oc.

O Signifies Honour, Greatness, No-

ble Persons of all Degrees.

Denotes Women, Pleasure, Pastime, all kinds of delight, Mirth, Persumes, &c.

Denotes all kinds of Scribes, Secretaries, Mathematicians, Servants,

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Dignifies Women in General, and all common and vulgar Persons, &c.

Of the fixed Stars so called (because they always keep the same invariable diffance from one another, and from the Eclyptick) the Astronomers could never find more than 1022, which they have discovered by the help of their Tele-

Telescopes as being nearer to us and more in view, and because the Stars are not equal in greatness or bigness, they make fix differences, appointing to

The first Magnitude 15 Stars, whereof every one containeth the Earth 207

times.

The second Magnitude45Stars, whereof every one containeth the Earth 90 time.

The third Magnitude 208 Stars, whereof every one containeth the Earth 72

times.

The fourth Magnitude 474 Stars, whereof every one containeth the Earth 54 times.

The fifth Magnitude 217 Stars, whereof every one containeth the Earth 50

times.

The fixth Magnitude 49 small Stars which containers the Earth 18 or 20 times.

Besides these are 14 others, whereof 5 are called Cloudy, and the other Mifty or Dark, because hardly to be perceived. But Galilaus by Telescope-observations found 62500 Stars, where but 62 appeared to the Bare Eye. AS AS

As to their Substance the Modern Philosophers and Astronomers suppose their Bodies Compound and not Simple, made up of Elementary matter, formed into Fiery Globes, and confifting of matter Solid and Liquid as this Terraqueous Their Light some con-Globe below. fider to be innate others think it borrowed of the Sun. Their Colour various according to the difference of their Light, tempered by the divers constitutions of their matter or Substance, some appearing ruddy, others bright, &c. whence fome have made an estimate of their Natures, and rang'd them under the feveralPlanets. Their Scintillation distinguisheth them from the Planets which have no fuch Twinkling or Glimmering Light. Of their Number and Magnitude we have spoke; and their Figures tho seemingly round are not Mathematically fo, for their Suverficies is found to be uneven and to confift of many Angles and Sides.

The Aftronomers divide all the fixed Stars to them known into 48 Images or Confellations, whereof 12 are in the Zodiack and named before. The others are 21 placed in the Northern, and 15 in the Southern Hemisphere.

In

In Aries 3 Stars are most conspicuous.

2 in the left horn, and 1 between the horns.

In Taurus are Aldebaran in his Eye, 7 Stars called Pleiades in his Neck, and 5 called the Hyades near the great Star called the Bulls Eye or Aldebaran.

In Gemini are 4 Stars, 1 of which is on the North Head of the Twins called Castor, another in the South Pollux, 1 on the right foot of Castor, t'other on the left of Pollux.

In Cancer scarce any Stars appear, be-

fides one near to the right Claw.

In Leo are divers bright Stars, two whereof are of the first Magnitude, that on the Breast called Cor Leonis, and that in his Tail called the Lyons Tail.

In Virgo are several bright Stars, one of the first Magnitude being called Spica Virginis standing in the Ear of Corn in her left hand.

In Libra are two very bright Stars called the Scales.

In Scorpio are feveral great Stars, one

of'em called the Scorpions Heart.

In Sagittarius are 4 chief Stars on his Shoulder making a Trapezium or Table, and 3 or 4 resembling a Bow, with one imitating an Arrow.

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In Capricornus are 4, 2 in his Tail, and 2 other in his Horns.

In Aquarius are several Stars of the

third, first and fourth Magnitude.

In Pisces are several small Stars, but bound with a Ribband adorned with

Stars of the first Magnitude.

The Constellations without the Zodiack are Northern which appear in our Hemisphere and are these following, beginning with the Constellation next the Pole.

Orla Minor hath 7 Stars, 4 whereof are in a square Figure, the other 3 in the Tail, the hindermost and brightest being called the North Star because nearer to the Pole than any other.

Ursa Major hath also 7 Stars in Position as the former. This Constellation was anciently called Plaustrum Majus or

the greater Wain.

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Bootes the Herdsman, hath many bright Stars the chiefest of which betwixt his Thighs on the Rim or edge of his Coat is called Arcturus.

The Dragon hath many Stars none greater than of the third Magnitude,

The Crown of Ariadne represents a half Circle composed of five Stars.

Engonasi or Hercules kneeling hath

feveral great Stars therein.

Lyra the Harp hath the most eminent Star next to the Dog-Star, and some others.

The Swan is an illustrious Constella-

tion within the Milky Way.

Cepheus hath but few bright Stars, his right foot stands on the Tailof Urfa Minor:

Cassiopea the Lady in her Chair, hath s

Stars of the third Magnitude.

Perseus placed between the feet of Cassiopea and the Bull, hath a bright Star on the Back, and another called Medusa's head in his left hand, and 4 more called Gorgons.

Andromeda hath 3 Stars of the second Magnitude, the last in the Head com-

mon to her and Pegasus.

Deltolton or the Triangle, consists of 3 bright Stars of the fourth Magnitude.

Auriga the Waggoner, hath 3 Stars, the chief called Capra the Goat on the Shoulder.

Pegasus the flying Horse hath 7 great Stars, one called the Mouth of Pegasus.

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The Dolphin between the Colt and the Eagle hath 10 Stars.

The Arrow hath 5 Stars, that at the

Points end of the fourth Magnitude.

The Colt is as it were, but the shadow of the Head of Pegasus, and hath 4 Stars.

The Eagle hath feveral bright Stars, and one called the bright Star of the

Eagle.

Serpentarius, Ophiuchus, or the Serpent Bearer is a large Asterism or Constellation, but hath no Stars greater than of the third Magnitude.

The Serpent or Ophiuchus hath several Stars of the third and fourth Magni-

tude.

The Southern figns are 15 in Number being these following Constellations.

The Whale situate under the Fishes and the Ram, having a vast wide Mouth hath therein a Star of the sirst Magnitude called the bright Star of the Jawbone of the Whale, and another as big in the midst of the point of his Tail, and other large Stars.

Eridanus is a long and winding Asterism betwixt Orion and the Whale.

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The Hare hath 4 Stars of the first Magnitude, and among others 4 smaller in his Ears.

Orion hath many bright Stars, 2 in his Shoulder, 3 in his Girdle called 3 Kings, one in his right Knee, and another in his left foot called Regel.

Canis Major hath not his equal for a

bright Star, called Syrius.

Canis Minor riseth before the great Dog, and hath a bright Star in his Neck, and another on his Thigh, called Procyon.

The Ship Argo hath but a few Stars to be feen, except one at the Helm, call-

ed Canopus.

Hydra the Water Serpent hath a bright Star in the Breast, called Cor Hydra.

The Bowl or Cup on the midst of Hy-

dra hath a C or half round of Stars.

The Crow hath a Table in it consisting

of 4 pretty large Stars.

The Centaur besides 14 visible Stars, hath 4 called the Crosiers, by which Mariners sail in the Southern Hemisphere, as here by the Pole Star.

The Wolf whose head reacheth the middle of the Scorpion, hath no ve-

ry great Stars.

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The Altar or Censer is for the most part hid under the bending of the Scorpions Tail.

The South Crown hath one notable Star among others called Vranifous or

the petty Heaven.

The South Fish hath many pretty large Stars, and one called Tomabant very large in its Mouth.

The unformed Stars are so called as being comprehended under no Figure or Image.

The Galaxy or Milky way is nothing else but a vast Multitude of thick set

Stars.

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Note, When the Sun or any Planet is faid to be in a fign, the meaning is that it is placed under it, or Intervenes between

our Eye and that fign.

Concerning the Nature, Original and Affections of the Planets, as also concerning the Principle of the Planets Motion and of their Direction, Station and Retrogradation, it being too large a discourse abundantly to treat of here, I shall referr you to the Astronomers and Astrologers who have wrote thereof at large, and to the following compendious Treatise of Astrology for a brief account thereof.

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By the Ascensional difference and Motions of the Planets and Stars is known the Increase and Decrease of the Artistical Day in every Latitude, and the distinction of Times and Seasons, and the several kinds of Days and Weeks, Months and Years. But this Volume only admitting a compendious Abstract of what may be instructive and constantly useful, I shall therefore insert from Mr. Seller's Atlas Calestis.

A Perpetual Almanack.

Fanu.	l Febr.	Mar	ch Ap	ril	May	June
At Good	Dove Chris			orge id	Brown David	Efquire Fryer. Decem.
Fuly	Augu	F Sep	. 08	ober	Nov.	
lo.T	To fir	d the I	Dominica	l Let	ter for e	rer.
C 1 B 2 A 3 G F 1000 1616 44 72 1700	E 1 D 2 C 3 B A 1200 20 48 76	G 1 F 2 E 3 D C 1400 24 52 80	B 1 A 2 G 3 F E 1600 28 56 84	A 110	1300 12 26 60 64 8 92 6 20	F 3 B E D 0 1500 6 40 68 2 96
2400	1900	36	2300	180	0 2000	
	1 2		431	5 12	1926	

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All those Years expressed in the Tables are all Leap-Years, as 1000, 1200, &c. and have each of them two Dominical Letters, as may be seen in their respective Columns over their heads. The other Figures as 20, 24, 28, 32, 60. are all Leap years also, the use of which are thus explained, 1. Suppose the Dominical Letter is required for 1716, look for 1700 in one Column, and in another for 16 you will find it is Leap year and the Dominical Letters A G. 2. Suppose you would know the Dominical Letter for the year 1709, look for 9 which you cannot find, therefore look for the year before which is 8, and that is Leap year and the Dominical Letters DC. Now C being the Dominical Letter for the latter part of the year 1708. The next Letter before it in the Alphabetical Order is B, which you will find on the top of the next Column with a I by it, which tells you it is the first after Leap year, and that the Dominical Letter is B, and so for 1710 the Dominical Letter is A, and the fecond after Leap year, the same is understood of all the rest.

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For the finding the day of the Month by the short Verse, take notice, the first Letter in each word is the same Week day Letter that always begins the Month, as A always begins January, and so of the rest according to the Order in the Diffich. Therefore would I know what day of the Month the first Sunday in June will be on, Anno 1709, finding as before B is the Dominical Letter; I find by the Distich E begins the Month, therefore counting in the Natural order of the Alphabet on to B thus, E 1, F 2, G 3, A 4, B 5, I find the first Sunday in June is the 5th. day of the Month. would know what day of the Month the first Thursday of July is in 1709 the Dominical Letter being B I find by the Verse the Month of July begins with G, therefore I fay G 1, A 2, B 3, (which is Sunday) C therefore is Monday, D Tuefday, E Wednesday, and F Thursday which is 7 from G, and therefore the first Thursday falls on the 7th day of the Month. The Month begins with a Fryday, so caft your Eye down to a small Table on the bottom of the faid Almanack, and there you find in the first row of Figures, 1, 8, 15, 22, 29, which you may reckon to be always the same days Aa 4

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of the Week, the Month begins with, and fo of the rest.

Because I intend to set down here, some of Mr. Seller's short Rules to find the Golden Number, Cycle of the Sun, Indiction, &c. which are of good use to all. I shall in the first place declare the natural Reason and Definition of them.

The Prime or Golden Number, so called because marked by Julius Casar in the Calendar with Letters of Gold, is a Circle of 19 years in which it was supposed all the Lunations and Aspects between the Sun and Moon did return to the same place: Its chief use being to find the Age and Change of the Moon.

The Cycle of the Sun, is a Revolutional Number of 28 years in which space is a change of all the Sunday Letters for every year, whereby is known the true order of the Sunday Letter. A. being placed against the first day of January and the rest in order to the years end.

The Epact, is a Number not exceeding 30, because the Moon between her changes never exceeds 30 days, and thereby the Lunar year consisting of 12 Months is less than the solar by 11 days, for to e-

very

very Lunar Month is reckoned but 29 days and half, so a Lunar year contains 354 days and the Solar 365 days. The difference is 11 days, and this is called

the Epact.

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The Indiction, Is a Number of 5, 10, or 15 years used by the ancient Romans in Numbring of years, and set down by the Bishops of Rome in their Charters. The ancient Romans used also a Division of the Solar Month into Kalends, Nones, and Ides, and therefore will I

declare what they be.

The Kalends were the first day of every Month from which they counted backwards. As the first of April they named the Kalends of April, and the last of March, Pridie Kalendas Aprilis, the day before that, the third Kalends of April, the next day before that, the fourth Kalends of April, and fo on till they came to the Ides. This word Kalends came from the Greek Verb Calo, viz. to call, for the first day of every Month the Cryer standing on a high place, made 4 or more calls to fignify to the People how many days in that Month the Fairs or Markets called Nunding should endure, from which word Nundine sprang.

None or Nones, that is to say, the days of the Fairs, during which time the Romans never worshipped any God. Every Month had 4 Nones, except March, May, July, and October which had 6.

Ides were those days by which the Nones were divided from the rest, and were 8 in every Month, dividing in a manner the whole Month into two equal parts, for the first Ides commonly fell on the 13, 14 or 15th. day of the Month.

To find the Golden Number, Cycle of the Sun and Indiction.

When 1, 9, 3, to the year hath added been Divide by 19, 28, 15.

Example.

To 1702 add 1 which makes 1703, Divide that by 19, and there remains 12, which is the Golden Number for that year. Again to 1702 add 9 and the Sum is 1711, which divide by 28, the residue is 3, the Cycle of the Sun for that year. Lastly to 1702 add 3, the Sum is 1705, which being divided by

by 15 the Remainder is 10, the Indicti-

The Golden Number given to find the Epact.

Divide by 3, for each one left add 10, 30 reject, the Prime makes Epact then.

In 1702 the Golden Number is 12, which divide by 3, and there remains 0, therefore 10 times 0 is but 0, which added to 12 makes nothing more, therefore 12 is the Epact for that year.

To find if it be Leap year or past.

Divîde the year by 4, what's left shall be For Leap year 0, for past 1, 2 or 3.

Anno 1702 divided by 4, there remains 2, which shews it to be the second after Leap year.

To name the Planets right in order.

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If you would count the Planets soon, Remember SIM SVM and the Moon.

Beginning at the highest Planet S stands for Saturne, I for Jupiter, M for Mars,

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S for Sol, V for Venus, M for Mercury, beneath which is Luna the lowest Planet from the Heavens, and nearest to the Earth.

The Number of Days in each Month.

Thirty Days hath September, April, June and November, February hath twenty eight alone, All the rest have thirty and one.

And now because many Astronomical Elements, Definitions and Problems are used therein, I hope it cannot be thought improper or offensive to speak somewhat briefly and recreatively, for the Readers small insight into the Art of,

Dyalling.

This Art may be performed three several ways, viz. Geometrically, Arithmetically, and Instrumentally of all which Ill give a touch in their Order.

Geometrically, by projecting the Circles of the Sphære upon the Plain it self with Scale and Compass. A Dyal may

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be made upon any plain superficies, and all plain superficies are posited in one or other of these three Positions, viz. either Parallel, Perpendicular, or Oblique to the Horizon of the place wherein the Plain is seated, and all the Hour Lines drawn upon any plain are great Circles of the Sphære which being projected upon a plain superficies become strait Lines.

Now the Art of Dyaling confifteth chiefly in the finding out of these Lines, and their true distances each from the other which continually vary, according as the Plains upon which they are described or projected are situated in re-

fpect of the Horizon of the place.

Of these Plains there are 3 varieties, viz. 1 Parallel to the Horizon as is the Horizontal (otherwise Vertical) Plain only. 2 Perpendicular to the Horizon, and such are all Erect Plains which be either Direct, as North and South, East and West or Declining. 3 Reclining from the Zenith, or inclining to the Horizon, and these are either Direct Reclining and Inclining North and South, or East and West. Declining or Reclining and Inclining.

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Particular Dyals are in Number 25 which may be reduced to 17 by supplying the inclining Plains from their opposite Recliners which are indeed the same.

These Plains some Denominate from the sight or Positions of their Axis in the Heavens, others denominate them from the Circles of the Sphære in which they lye. Of all which Plains and how to draw the Hour Lines thereupon with other their Mechanick operations in that Art, you may read in Authors at large, but it is not my meaning to describe them here.

Arithmetically, by the Cannons or Tables of Artificial Sines and Tangents being a more accurate performance of this Art, by which the feveral Requifites in all Plains may be Arithmetically attained. But the Tables being vulgarly known, and the use of them no less common, as also the Rules whereby to find the before mentioned Requisites, to be seen in several Books which treat of this Science, I purpose no more thereof in this place.

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Instrumentally, by a plain and portable Instrument accommodated with Lines for that purpose and called an Horological Trigon,

Trigon whereby Dyals may be delineated upon all forts of Plain Superficies, the description of which Instrument and its use you may see at large in Mr. Leybourn's Art of Dyaling, see also the description and use of the doubleHorizontal Dyal in Math. Recrea.

Before I proceed to Aftrology I will here give some necessary Problems upon the Terrestrial Globe, and some Astrono-

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Cosmographical and Astronomical Problems and Observations.

I.

To find the Longitude of a Country.

If it be upon the Globe bring the Country to the Brazen Meridian and whatsoever Degree that Brazen Meridian cuts in the Æquinoctial that Degree is in the Longitude of that place. If it be in a Map then mark what Meridian passeth over it, so have you the Longitude thereof, if no Meridian pass over it, then take a pair of Compasses and measure the distance betwixt the Place and the next Meridian, and apply it to the

the divided Parallel or Æquator so have you the Longitude required.

II.

To find the Latitude of a Country.

The Latitude of a Country is the difference of a Country from the Æquinoctial, or it is an Arch of the Meridian contained between the Zenith of the place and the Æquator, which is twofold, viz. either North Latitude or South Latitude, either of which extended from the Æquinoctial to either Pole, so the greatest Latitude that can be is but 90 If any Northern Country Degrees. have the Artick Circle Vertical which is the Latitude of 66 Deg. 30 Min. the Sun will touch the Horizon in the North part thereof, and the longest day will be there then 24 hours. If the Country have less Lat. than 66 Deg. 30 Min. the Sun will rife and fet, but if it have more Latitude than 66 Deg. 30 Min. it will be visible for many days. And if the Country be under the Pole, the Sun will make a circular motion above the Earth and be visible for half a year, so under

der the Pole there is but one day and

night in the whole year.

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If it be upon a Globe, bring the place to the Brazen Meridian, and the Number of Degrees which meeteth therewith, is the Latitude of the place: or with a pair of Compasses take the distance between the Country and the Equinoctial, which applyed unto the Equinoctial, will shew the Latitude of that Country, which is equal to the Poles height. If it be upon a Map, then mark what Parallel passeth over the Country, and where it croffeth the Meridian, that shall be the Latitude. But if no Parallel passeth over it, then take the distance between the place and the next Parallel, which applied to the divided Meridian from that Parallel, will shew the Latitude of that place.

III.

The Climates.

phically, fignify nothing else, but when the length of the longest day of any place is half an hour longer or shorter than it is in another place (and so of the shortest day;) and this account to begin from the B b Æqui-

Aguinoctial Circle, feeing all Countries under it have the shortest and longest day that can be but 12 hours. But all other Countries that are from the Æquinoctial Circle either towards the North or South of it unto the Poles themselves, are faid to be in fome one Climate or other; from the Æquinoctial to either of the Polar Circles (which are in the Lat. of 66 Deg. 30 Min.) between each of which Polar Circles and the Equinoctial Circle there is accounted 24 Climates, which differ one from another by half an hours time: then from each Polar Circle to each Pole there are reckoned 6 other Climates which differ one from another by a Months time: So that the whole Earth is divided into 60 Climates, 30 being allotted to the Northern Hemisphere, and 30 to the Southern. here note that tho' thefe Climates which are between the Æquinoctial and the Polar Circles are equal one unto the other in respect of time, to wit, by half an hour; yet the Latitude, Breadth or Interval contained between Climate and Climate is not equal, and by how much any Climate is further from the Æquinoctial than another Clmate, by fo much the leffer is the Interval between that

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that Climate and the next: fo those that are nearest the Æquinoctial are largest, and those which are farthest off most contracted. And to find what Climate any

Country is under,

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Substract the length of an Æquinoctial day, to wit 12 hours, from the length of the longest day of that Country, the Remainder being doubled shews the Climate. So at London the longest day is near 16 hours and a half, 12 taken from it, there remains 4 hours and half, which doubled makes 9 half hours, that is 9 Climates, so London is in the 9th. Climate.

IV.

To find the distances of Places.

If it be upon a Globe, then with a pair of Compasses take the distance between the 2 places, and apply it to the divided Meridian or Equator, and the Number of Degrees shall shew the distance, each Degree being 60 Miles. If it be on a Map (according to Wright's projection) take the distance with a pair of Compasses between the 2 places, and apply this distance to the divided Bb 2 Merid

Meridian on the Map, right against the two places; so as many Degrees as is contained between the feet of the Compasses, so much is the distance between the two places. If the distance of two places be required in a particular Map then with the Compasses take the distance between the two places and apply it to the scale of Miles, so have you the distance: If the scale be too short take the scale between the Compasses, and apply that to the two places as often as you can, so have you the distance required.

V.

Imagine there were a hole thro'the Earth, and that a Milstone should be let fall down this hole, and to move a Mile in each Minute of time, it would be more than two days and a half, before it would come to the Center, and being there it would hang in the Air.

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If a Man were let down to the Center of the Earth, there would he hang having both his head and his heels up towards Heaven.

VII.

VII.

The Moon runs a greater Compass each hour, than if in the same time she should run twice the Circumference of the whole Earth.

VIII.

The Sun in his proper Sphære according to the *Ptolemaick* System must move more than 7570 miles in one Minute of Time.

IX.

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up II. It is of a far higher nature to confider the exceeding quickness of the Starry Firmament, for a Star being in the Æquator (which is just between the Poles of the World) makes 12598666 miles in one Hour, which is 209974 miles in one Minute of time, and if a Horseman should ride every day 40 Miles, he could not ride such a Compass in 1000 years, as the Starry Firmament moves in one Hour, which is more than if one should move about the Earth a 1000 times in an hour, which is quicker than possibly thought can be imagined: and if a Star B b 2 should

should fly in the Air with such a prodigious swiftness, it would burn and confume all the World here below. Behold therefore how time passeth and death postethon. This made Copernicus not unadvisedly to attribue this Motion of Primum Mobile to the Earth and not to the Starry Firmament, for it is beyond humane sence to apprehend or conceive the Rapture and Violence of that Motion must be quicker than thought, and the word of God telleth us that the Lord made all things in Number, Measure, Weight and Time.

X.

Under the Æquinoctial the Needle hangs in Æquilibrio, but in these parts it inclines under the Horizon, and being under the Pole it is thought it will hang Vertical.

XI.

In the Countrys which are without the Tropical Circles, the Sun comes East and West every day for half a year, but being under the Equinoctial the Sun is never never East nor West but twice in the year, to wit, the 10th of March and 13th of September.

XII.

If a Ship be in the Latitude of 23 deg. 30 min. that is, if it hath either of the Tropicks Vertical, then at what time the Suns Altitude is equal to his distance from any of the Æquinoctial points, then the Sun is due East or West.

XIII.

If a Ship be between the Æquinoctial and either of the Tropicks, the Sun will cometwice to one point of the Compass in the Forenoon, that is in one and the same Position.

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XIV.

Under the Æquinoctial near Guinea, there is but 2 forts of Windsall the year, 6 Months a Northerly Wind, and 6 Months a Southerly wind, and the Flux of the Sea is accordingly.

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XV.

If two Ships under the Æquinoctial be 100 Leagues afunder, and should fail Northerly until they were come under the ArtickCircle, they should then be but 50 Leagues asunder.

XVI.

Those which have the Artick Circles Vertical, when the Sun is in the Tropick of Cancer, the Sun setteth not, but toucheth the Western part of the Horizon.

XVII.

If the Compliment of the Suns height at Noon be found equal to the Suns Declination for that day, then the Æquinoctial is Vertical; or a Ship making such an Observation, the Æquinoctial is in the Zenith, by which Navigators know when they cross the Line in the Travels to the Indies or other parts.

XVIII.

XVIII.

The Sun being in the Æquinoctial the extremity of the Style in any Sun Dyal upon a Plain maketh a right Line, otherwise it is Eclyptical, Hyperbolical, &c.

XIX.

When the shadow of a Man or other thing upon a Horizontal Plain is equal unto its length, then is the Sun in the middle point between the Horizon and the Zenith, that is 45 Degrees high.

XX.

The difference of the Apogæon or farthest distance of the Sun and the Perigæon is 315244 Italian Miles.

Astrology being founded upon the Science of Astronomy I shall proceed to give some small account of the Rudiments thereof.

Astrology.

Astrologia, derived from the Greek aser, i. Astrum & x6705, i. e. Ratio, Sermo, est enim Scientia de Astrorum motibus, or a Science which by considering the Motions, Aspects and Influences of the Stars doth Prognosticate or Judge of things to come.

The Number, Nature and Character of the Planets I have spoke somewhat of before, and therefore shall add here only the two Nodes or certain points of the Heavens Named and Charactered thus, & the Dragons Head, & the Dragons

Tail.

The Planets have allowed them every one, except Sol and Luna, two of these Signs for their Houses, as to Saturn belongs Capricorn and Aquarius; to Jupiter Sagitarij and Pisces; to Mars Aries and Scorpio; to Sol, Leo; to Venus, Taurus and Libra; to Mercury, Gemini and Virgo, and to Luna, Cancer. The Planets by their continual motion thro' the 12 Signs make several Angles or Aspects the most forcible of which are these five.

& Conjunction, * Sextile, D Quadrate,

A Trine, 8 Opposition.

A Conjunction is when two Planets are in one and the same Degree and Minute of a Sign; and this is either good or bad as the Planets are either Friends or Enemies.

A Sextile Aspect is when two Planets are two Signs or 60 Degrees distant, as 4 in 15 degrees of Γ and Γ in 15 degrees of Π , here Jupiter is in a Sextile Aspect to Saturn; this is an Aspect of

Friendship.

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2 ts A Quadrate Aspect is when two Planets are 3 Signs or 90 degrees distant, as Mars in 10 degrees of Taurus, and Venus in 10 degrees of Leo, this particular Quadrate Aspect is of imperfect enmity, and Artists say that the Persons signifyed thereby may have jarrs at some times, but such as may be reconciled again.

A Trine Aspect is when any two Planets are 4 Signs or 120 degrees distant as Mars in 12 degrees of Aries, and Sol in 12 degrees of Leo. Here Sol and Mars are said to be in Trine Aspect, and this is an Aspect of perfect Love and

Friendship.

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An Opposition is when two Planets are diametrically opposite; which is when they are 6 Signs or 180 degrees (which is one half of the Circle asunder) and this is an Aspect of perfect hatred.

A Partile Aspect is when two Planets are in a perfect Aspect to the very same

degree and minute.

Dexter Aspects are those which are contrary to the succession of Signs, as a Planet in Aries casts his Sextile Dexter to Aquarius.

Sinister Aspect is with the succession of Signs, as a Planet in Aries casts his Sextile

Sinister in Gemini.

The Division and Signification of the Twelve Signs of the Zodiack with the Nature and signification of each Planet in each and every of the Houses. Also the Essential and Accidental Dignities of the Planets, and the Kingdoms and Cities under the Signs and Planets, being subjects too large and burthensome for this place by much, I refer you to the Books of Practical Astrology, and invite the young Student of this Science to understand well these following Astrological

Terms of Art.

Application of the Planets is performed three ways, I When a light Planet being direct and swift in Motion, applies to a Planet more ponderous and flow in Motion, as Mercury in 8 degrees of Aries, and Jupiter in 12 degrees of Gemini, and both direct, here Mercury applies to a Sextile of Jupiter by direct Application. 2 When they are both Retrograde, as Mercury in 20 deg. of Aries, and Jupiter in 15 degrees of Gemini; here Mercury the lighter Planet applies to the Sextile Aspect of Jupiter and this is by Retrogra-3 When one of the Planets are direct, and the other Retrograde, as fuppose Mercury were Retrograde in 18 degrees of Aries, and Jupiter, direct in 14 degrees of Gemini; here Mercury applies to a Sextile of Jupiter by his Retrograde motion.

Prohibition is when two Planets are applying either by Body or Aspect and before they come to their Partile Aspect another Planet meets with the Aspect of the former and so prohibits it. As Mars in 10 degrees of Aries, and Venus in 6 degrees of Aries, and Mercury in 5 degrees of Aries: here Venus is ap-

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plying to a Conjunction of Mars; but before they come to their Partile Conjunction Mercury being more swift in motion comes to a Conjunction of Mars before Venus, and so prohibits Venus.

Separation is when two Planets have been lately in Conjunction or Aspect, and are separated from it: As Saturn in 10 degrees of Libra, and Mercury in 12 degrees of Libra; here Mercury is separating from a Conjunction of Saturn, but they are still in Platick Conjunction so long as they remain within their Orbs.

Translation of Light and Virtue, is when a lighter Planet separates from the Body or Aspect of a more weighty one, and immediately applies to another superior Planet, and so translates the light and vertue of the first Planet to that which he applies to: As Mercury in 8 degrees of Cancer, Saturn in 6, and Jupiter in 13, here Mercury is separated from a Conjunction of Saturn, and applies to a Conjunction of Jupiter, and so translates the vertue of Saturn to Jupiter.

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and out in t Refrenation is when a Planet is applying to the Body or Aspect of another, and before he comes to it he falls Retrograde, and so refrains by his Retrograde motion: As Saturn in 16 degrees of Taurus and Mars in 7 degrees of Cancer, here Mars applies to a Sextile of Saturn; but before he comes to it, he becomes Retrograde.

Combustion, a Planet is said to be Combust of Sol when he is within 8 degrees 30 minutes of his Body, either before or after their Conjunction: but a Planet is more afflicted when he is applying to his Body, than when he is separating from

Combustion.

Reception is when two Planets are in each others Dignities, and it may be either by House, Exaltation, Triplicity or Term: As Sol in Cancer, and Luna in Leo; here they are in Reception by House, or Sol in Taurus and Luna in Aries; here they are in reception by Exaltation.

Retrograde is when a Planet moves backwards from 10 degrees to 9, 8, 7, and so contrary to the succession of signs out of i aurus into Aries, and is noted in the Ephimeris thus B.

Frustration is when a swift Planet applies to the Body or Aspect of a superiour Planet, and before he comes to it the superior Planet meets with the Body or Aspect of some other Planet, as Japiter in 15 degrees of Cancer, and Venus in 10 degrees of the same sign, and Mars in 14 degrees of Taurus, here Venus applies to a Conjunction of Jupiter; but before they come to their partile Conjunction, Mars comes to a Sextile of Jupiter, and so frustrates Venus.

Peregrine is when a Planet is posited in a sign wherein he hath no Essential

Dignities.

Under the Sun Beams, a Planet is faid to be under the Sun Beams untill he be removed 17 degrees from his Body.

Void of Course, a Planet is said to be void of course when he is separated from the Body or Aspect of another Planet, and doth not apply to the Body or Aspect of another Planet while he remaineth in that sign.

Swift of Course, is when a Planet moves more in 24 Hours than his mean motion, and he is said to be Slow of Course when he moves less in 24 Hours than his

mean motion.

Cazimi;

Cazimi. A Planet is faid to be in Cazimi or the Heart of the Sun, when he is within 6 minutes of his Body in respect

of Longitude and Latitude.

Besieging. A Planet is said to be besieged when he is between the Bodies of Saturn and Mars, as Saturn in 15 degrees, of Cancer, and Jupiter in 18 degrees, and Mars in 20; here Jupiter is besieged of Saturn and Mars.

Oriental is when a Planet rifeth before the Sun, and may be feen before Sun riling.

Occidental is when a Planet fets after the Sun, and may be feen after Sun

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Direct. A Planet is direct when he moves according to the fuccession of signs and out of 5 degrees to 6, 7, and fo forward.

Stationary is when a Planet moves not at all; which they do before and after Retrogradation.

Increasing in Light is departed from Sol

or Sol from him.

Longitude and Latitude of a Planet, also Declination, Right and Oblique Ascension, &c. may be seen before in Aftronomical Definitions.

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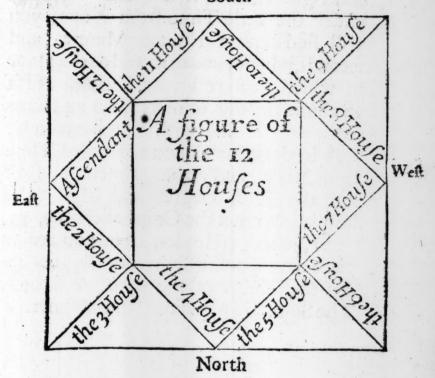
For more of the Theorique part of this Science I referr to Mr. Middleton's Practical Astrology and others, and now here will shew you how

To erect a Figure of Heaven, for any Hour, Day or Night.

The whole Sphere or Globe of Heaven is divided into 4 equal parts by the great Circles of the Meridian and Horizon, and each of these is divided again into 3 other parts by the Circles of Position which interfect the Æquator equally, and do likewise meet in the points of the Grand Meridian, and with the Horizon; which are in all 12, called by Astronomers the 12 Houses, of which there are four principal Angles; two of which fall equally upon the Horizon, the other upon the Meridian, that is to fay the First, the Fourth the Seventh, the Tenth. The following Houses are called Succedent Houses, the other Cadent Houses, which Aftrologers commonly draw in this manner.

South

South



The Lines in the Figure do shew the Cusps or entring into the Houses. But for the erecting of an Astrological Figure: First in your Ephemeris you are to get the true place of the Sun; and if the Minutes exceed 30 you are to add one degree more to the Suns place, then with those whole degrees enter the Table of Houses in that sign which you find Sol in, and in the Column of the

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10 House find the degree of the sign, and right against it on the left hand under the Title Time from Noon, you will find certain Hours, Minutes and feconds, which you are to add to the Hour in which you erect your Figure, and if the Sum amount to more than 24 Hours cast away 24 and with the Remainder feek in the great Column entituled Time from Noon, and right against it you shall find the Signs, Degrees and Minutes to be placed upon the Cusps of the 10, 11, 12, 1, 2 and 3 Houses, then you are to place the opposite Signsand Degrees upon the Cusps of the other 6 Houses. The Signs are opposite in this manner.

Signs
$$\left\{\begin{array}{c} \Upsilon \\ \Xi \\ \Pi \\ \Omega \end{array}\right\}$$
 Opposite $\left\{\begin{array}{c} \Xi \\ \mathfrak{m} \\ \Upsilon \\ \mathfrak{v}^{\mathfrak{p}} \end{array}\right\}$ Houses $\left\{\begin{array}{c} 10 \\ 11 \\ 12 \\ 1 \end{array}\right\}$ Opposite $\left\{\begin{array}{c} 4 \\ 5 \\ 6 \\ 7 \end{array}\right\}$

Here you see that Aries is opposite to Libra, and Taurus to Scorpio, Gemini to Sagittarius, &c. and so in like manner the 10th House is opposite to the 4th the 11th to the 5th, the 12th to the 6th, &c.

In the next place you are to take the places of the rest of your Planets in your Ephe-

Ephemeris and place them in the signs of your Figure; always remembring if the degrees of the Planets places be less than the degrees of the Cusp of your House you must place him before the Cusp thereof, but if the degrees be more than the Cusp of your House you must place him behind the Cusp thereof.

But if you erect a Figure for 8 or 9 hours afternoon, the Planets will require a Reduction to the hour of the Day; for all Ephemerides and Astronomical Tables are calculated from Noon to Noon, and so you are to reckon the time, as if you would erect a Figure for 2 a Clock in the Morning, you must account it at 14 hours after Noon the day preceding: but if it be only for a Horary Question a mental Reduction of the Planets places will be fufficient; only the Moon by the swiftness of her Motion will require a Reduction, and by adding 30 Minutes to her place for every hour afternoon, and substracting in the Forenoon 30 Minutes for each hour, you may gain her place truly enough for all ordinary Questions but for more exactness I referr you fuch Tables as reduce the Planets places to any Hour of the Day or Night, and proceed to give you an Example of E-Cc3 recting

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recting the Figure of Heaven just as I find one in Middleton's Practical Astro-

logy.

Suppose it were required to erect a Figure the 6 day of January 1677 at 3 Hours afternoon. In the Ephemeris you will find the Suns place to be 27 degrees 6 minutes of Capricorn, then look in the Table of Houses for Sol in Capricorn, then guiding your Eye down the fecond Column (marked at the top, Dom. *.) which is the Column of the 10th House) and near the bottom of the Table you'll find 27 degrees, and against that in the great Column on the left hand intituled Time from Noon, 19 Hours, 56 Minutes, 12 Seconds, which add to the 3 Hours the time of erecting the Figure, and it makes 22 Hours, 56 Minutes, 12 Seconds, which Number feek in the Column entituled time from Noon, and the nearest Number to it is 22 Hours, 57 Minutes, 24 Seconds. Then look in the Column of the 10th House, and you find 13 degrees and * at the top, for the Cusp of the 10th House, and in the Column for the 11th House you find 21 degrees, 16 minutes of r, and in the Column of the 12th House you find 12 degrees, 31 MiMinutes of II, and for the Ascendant degrees 54 minutes of 56, for the second House you find 4 Degrees 21 minutes of Ω, for the third House 21 degrees 18 minutes of Ω, and so you have the Cusps of the sixOrientalHouses, and upon the other six Houses you are to place the Opposite signs. Then seek in the Ephimeris for the places of the Planets, and against the 6th of January 1677 you find them thus.

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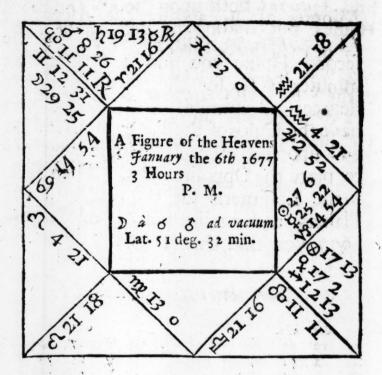
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The places of the Planets.

	deg.	min.					deg.	min.	
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1 page	ny or in	The	89 is	always	oppolite				

Having thus found the Cusps of the Houses and places of the Planets you place them as you see in the following Figure.



Here you see the Signs and Degrees placed upon the Cusps of the 6 Oriental Houses which were formerly found in the Table of Houses, and the opposite signs upon the opposite Houses; and for the placing the Planets therein, first you found Saturn as aforesaid in Taurus, which is not the Cusp of any House, but intercepted between the Cusps of the 11 and 12th Houses; therefore he was placed in the 11th House as you may see in the Figure. Next you found Jupiter in 2 degrees, 52 minutes of Aquarius, you find

find Aquarius both upon the 9th and 8th Houses, but finding the degrees of Jupiter nearest the degrees of the 8th therefore was Jupiter placed before the Cusp of the 8th. Also finding Mars posited in 8 degrees, 26 minutes of Gemini which you find upon the Cusp of the 12th, but finding the degrees of the House more than the degrees of Mars therefore was Mars placed before the Cusp thereof, but still he shall be accounted in the 12th because he is within 5 degrees of the Cusp thereof. The rest of the places may be found posited in the Figure as was before directed.

I should now proceed to the Judicial part of Astrology, teaching the resolution of all manner of Horary Questions. But the Subject being abundantly too large for this little Volume I would have you to have recourse for further knowledge therein (if you desire it) to the Astrologers Books, and desire you will

accept of

A Table shewing what Planet rules every Hour of the Day and Night.

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	ida		N	igh	t.							
Sunaay	14	3	0	2	Q	D	LI	九	3	0	P	ğ
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Saturday	ğ	D	5	4	3	0	Q	ğ	D	5	¥	3

This Table is eafily to be understood, for know to every day in the Week is appropriated a several Planet, as to Sunday, to Monday, to Tuefday, &c. and therefore each Planet governs the first Hour. As you may perceive by the Table that the Sun governs the first hour after Sun-rising on Sunday, the second, the third, the fourth, and so on; Governs the first Planetary Hour of the Night that is after Sun set, the second, the third, &c. And so of all the rest.

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See the Treatife of Astrology in my Gentlemans Treasury, where you will find the Astrological Predictions of several Men, the Mutability of Fortune in several great Men, and Men born of low degree that attained to great Honours, also fatal contrarieties in one and the same Name, and Days observed by several Persons as lucky and unlucky, with several other things not here mentioned or described.

Des Cartes and Agrippa as they inveigh much against some other Sciences especially Agrippa, so doth the latter of them not spare or favour Astronomy, but particularly Aftrology, which he faith is an Art altogether fallacious, and that all the vanities of superstition flows out of the Bosom of Astrology, their whole Foundation being upon Conjectures, and comparing future Occurrences by past Events, which they have no pretence for, fince they allow that the Heavens never have nor will be in one exact Position since the World commenced, and yet they borrow the effects and influences of the from the most remote Ages in the World, beyond the memory of things, pretending themselves able to display the hidden Natures, Qualities, &c.) of all forts of Animals, Stones, Metals and Plants, and to shew how the same does depend on the Skies, and flow from the Stars, yet doth Eudoxus, Archelaus, Cassandrus, Halicarnassas and others confels 'tis impossible that any thing of certainty should be found out by the Art of Judicial Astrology, by reason of the

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the innumerable co-operating causes that attend the Heavenly influences; and fo Ptolemy is also of opinion. thermore they who have prescribed the Rules of Judgments, set down their maxims fo various and contradictory, that it is impossible for a Prognosticator out of fo many various and disagreeing opinions, to be able to pronounce any thing certain, unless he be inwardly inspired with some secret and hidden instinct and sence of future things, or unless by some occult and latent communication with the Devil. And Antiquity witnesseth that Zoroastres, Pharoah, Nebucchadnezer, Casar, Crassus, Pompey, Diatharus, Nero, Julian the Apostate and several others most addicted to Astrologers Predictions perished unfortunately, tho' they were promifed all things favourable and auspi-And who can believe that any person happily placed under Mars being in the Ninth, shall be able to cast out Devils with his presence only; or he who hath Saturn happily coustituted with Leo at his Nativity, shall when he departs this Life immediately return to Heaven, yet are these Hereties

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sies maintained by Petrus Aponensis, Ro: ger Bacon, Guido Bonatus, Arnoldus de Vila nova Philosophers; Aliacensis Cardinal and Divine, and many other famous Christian Doctors. Against which Aftrologers the most learned Picus Mirandula wrote twelve Books fo fully as scarce one Argument is omitted against it, and gave the killing blow to Aftrology. Amongst the ancient Romans it was prohibited, and most of the Holy Fathers Condemn'd, and utterly banished it out of the Territories of Christianity, and in the Synod of Martinus it was Anathematized. As to the Predi-Etion of Thales who is said to have foretold a scarcity of Olives and dearth of Oyl, fo commonly avouched by Aftrologers to maintain the Glory of their Science, Des Cartes, answers with an eafy reason, and most probable truth, that Thales being a great Natural Philosopher, and thereby well acquainted with the vertue of Water (which he maintained the principle of all things) he could not be Ignorant what Fruits stood in most need of Moisture, and how much they were beholding to Rain for their growth, which then being wanting, he might eafily know there would

be a scarcity without the precepts of Astrology; but if they will have it that Theles foreknew it only by that Art; why are not others who pretend to be fo well skilled therein as able to have the same opportunities of enriching themselves. As for the foretelling the deaths of Emperors and others, it was but Conjectures knowing most of 'em to be Tyrants, and hated, and thereupon also would they pretend to promise others the Empire and Dignities which fometimes spurring up ambitious Minds, they neglected no attempts to gain the Crown, the Aftrologers thereby occasioning Murders, and advancements by fecret Instructions rather than any Rules of Art, which they publickly pretended to, to gloss their Actions and advance the Honour of their Conjecturing Science: By the fame manner might Ascletarion foreknow the death of Domitian, and as for himself being torn to pieces by dogs 'twas but a meer guess, for Astrologers do not extend their predictions beyond death, and therefore he did not suppose his Body should be torn to pieces after his death, as it proved, but alive as a punishment for his boldness in foretelling the Emperors death, which being a common

mon punishment had it proved so, it had been by probability from Custom, but not of the Rules of Astrology.

For 6 several reasons that prove Jdicial Astrology to be vain and false, see in Blomes Body of Philosophy, Part 3. Chap. 14. in the History of Nature.

